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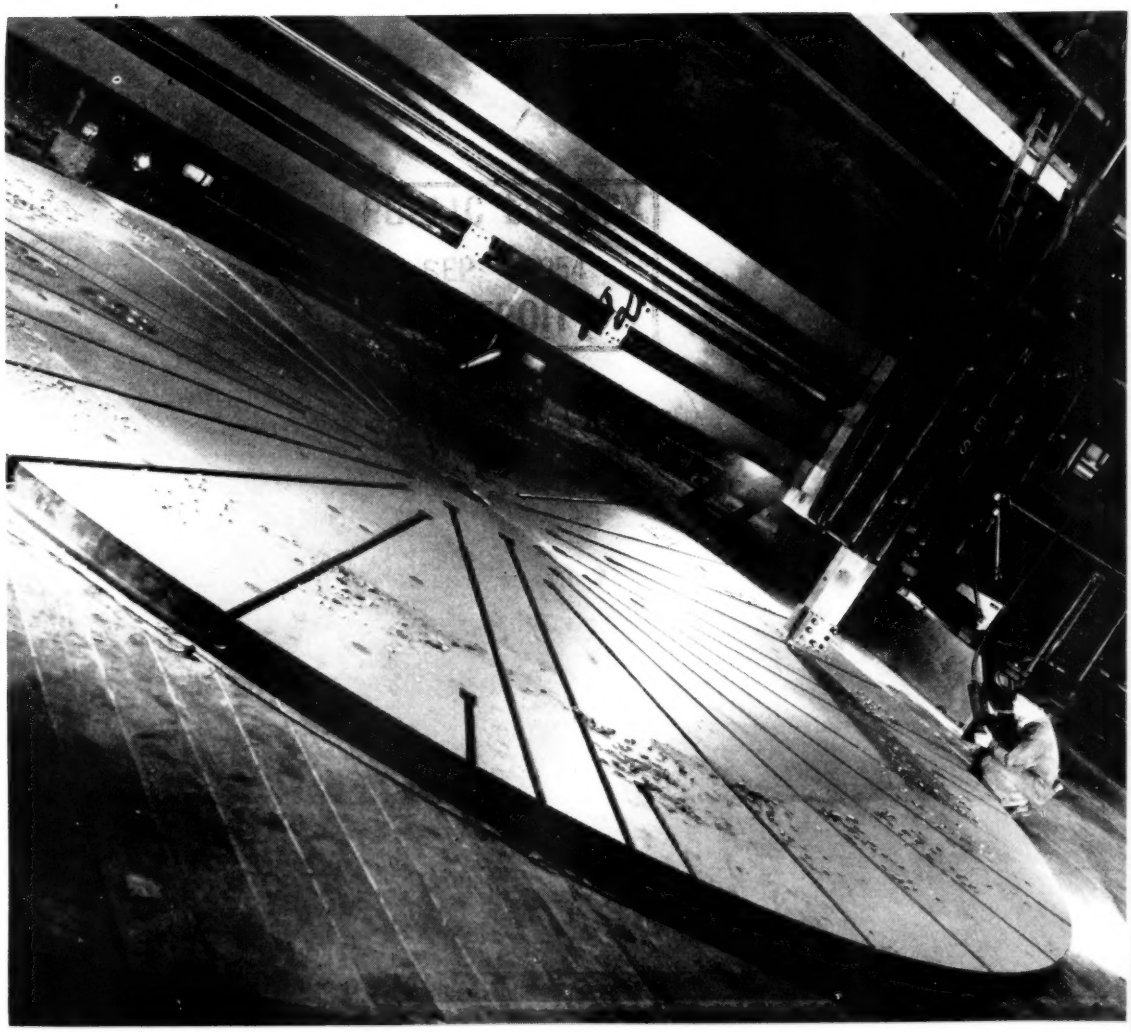
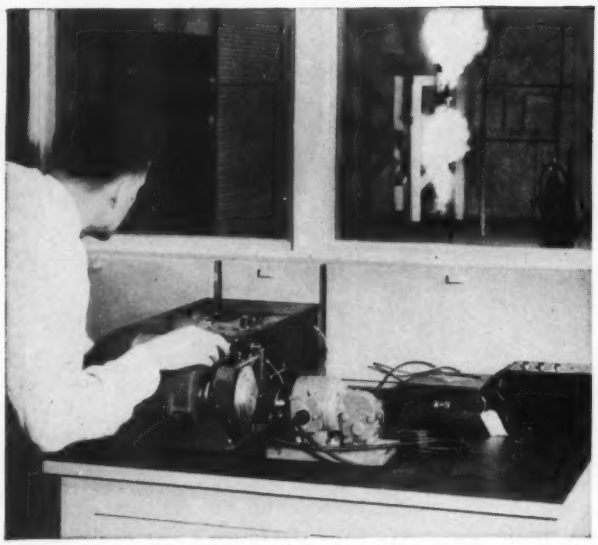


WESTERN SOCIETY OF ENGINEERS FOUNDED 1869

Vol. 7 SEPTEMBER, 1954 No. 4



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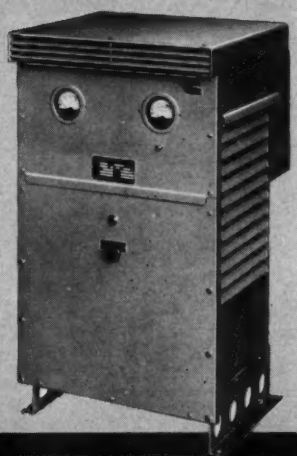

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Serving the Engineering Profession

SEPTEMBER, 1954 Vol. 7, No. 4

CONTENTS

COVER STORY

A photo of a giant jigsaw taken by Gulliver on his travels? Well, it could almost be. However, it is really the table of a boring mill. As this 30-foot table revolves, the cutting tool at the right moves across the table making the last leveling cut before the machine tool is placed in operation at an East Pittsburgh electrical works. The machine is capable of rotating 200-ton parts of large electrical generators.

—Westinghouse photo

Young Engineers Forum

Thomas G. Ayers, chairman of the Young Engineers' Forum, announces that the fifth Forum sponsored by the Western Society of Engineers will begin on Tuesday, October 12. The Forum will consist of six weekly dinner meetings to be held in the WSE dining room.

The theme for this Forum will again be "Engineering in Chicago Industry," and the objective is to provide young engineers an opportunity for broadening their knowledge of engineering in the major lines of business in the community.

The men who have been chosen to be speakers at the Forum are leaders in their particular industries. The program has been planned in such a way that there will be ample time for a discussion period following the speaker's remarks.

Emphasis will be placed on the young engineers having an opportunity to meet and become better acquainted with the speakers and other leaders in the profession during the social hour in the WSE lounge prior to the dinner meeting.

Registration fee for the series of six meetings is $25.00 Primarily the group is comprised of young engineers who are sponsored by the companies employing them. However, individual reservations will be accepted by the secretary's office until the enrollment limit of 125 is reached.

Following is the Forum program:

October 12, "Consulting Engineering"

Charles E. DeLeuw, president, DeLeuw, Cather and Company.

October 19, "Utility"

H. P. Sedwick, president, Public Service Company.

October 26, "Steel"

John H. Vohr, general superintendent, Gary Steel Works, U. S. Steel Corporation.

November 2, "Oil"

Thomas A. Abbott, manager, Engineering Research, Standard Oil Company (Indiana).

November 8, "Chemical"

Victor Conquest, vice-president and general manager of Research Division, Armour and Company.

November 16, "Manufacturing"

A. C. Monteith vice-president in charge of engineering, Westinghouse Electric Corporation.

October 13, Noon Luncheon Meeting

Speaker: Charles Michalski, traffic engineer, Citizens Traffic Safety Board, Chicago.

Subject: "Traffic Problems in South Africa." Start the season right and get the Wednesday Noon Luncheon habit. If you haven't attended before, here's a fine time to start. Color slides will make more interesting an already interesting subject.

October 18, Fire Protection and Safety Engineering Section

Speaker: William Eathorne, Bureau of Mines, out of Pittsburgh, Pa.

Subject: "Static Electricity." This talk and demonstration should spark your interest in an electrifying subject. Eathorne, a graduate of the School of Metaliferous Mining, Camborne, England, knows his subject well, and is guaranteed to be interesting.

His Role in Public Health

The Sanitary Engineer

By Mark D. Hollis

This centennial celebration comes at a time when technological progress has entered the steep incline of a huge S-curve. All of us wonder and few dare to predict where the trend will take us. We have seen the forces of engineering tighten the network of human ties throughout the world. We have seen them multiply and concentrate the power of the men at the control panel in human affairs. And we do not feel that we know as yet how to govern or tame the inevitable consequences or reactions.

Engineers have won high honors for contributing to productivity and to the instruments of social control. But engineers cannot wear such honors proudly if they reject responsibility for certain consequences of their work: such as specific disruptive effects of technology on the environment and hence on public health. If the engineer is to live up to his popular reputation as the man who can work miracles, he must meet the challenge to do as much for public health as he has done for industry, commerce, communications, and defense.

Our discussion concerns itself with only a small segment of the engineering profession—the sanitary engineer. For this discipline, the present moment is perhaps even more significant than for engineering as a whole. The profession is undergoing a transitional development. It faces a golden era. The extent to which health hazards in the environment are kept under control is likely to be the governing factor in the rate of advancement of the total technology.

The Sanitary Engineer Defined

As the physician practices a discipline which applies to the person of his patient, the sanitary engineer practices a discipline which applies to the whole people's environment—air, water, food, and shelter. The sanitary engineer is distinguished from other engineers in that, as he works with these basic essentials, he is concerned primarily with their effect on the public health. In its original meaning, the term sanitary described a contribution to mass health. The common association of "sanitary" with pipes and drains resulted from the fact that water supply and the removal of human wastes were and are basic health needs of all people. Both the physician and the sanitary engineer have the same objective: improvement of the health of the population. And this does not mean merely the absence of disease.

Evolution of Sanitary Engineering

Sanitary measures were practiced from earliest times, long before development of knowledge explaining these practices. Crude water purification procedures were used by priests and physicians of India as early as 2000 B.C. The Mosaic Law is an excellent example of how even the earliest civilizations recognized the interrelationship between environment and health. Frontinus, the Roman Gildersleeve, prepared the first detailed description of water works. The Roman aqueducts were an important factor in the high standard of living of Roman civilization.

At the other extreme in history, we are now entering the atomic age.

Sanitary Engineering—20th Century

Modern sanitary engineering is a 20th century product. This nation contributes to the profession an accumulated fund of knowledge dating from the origin of the Lawrence Experiment Station. Our water treatment advances—rapid sand filtration, chlorination, fluoridation, and numerous other measures—have won for the United States world leadership in this field. The art of sewage treatment has substantially improved. High-rate trickling filtration and the activated sludge process have transformed sewage treatment from mere removal of settleable solids to production of stabilized effluents. With industrial expansion, the science of waste treatment is becoming more and more complex. The industrial factor further complicates the pollution problem of our waterways. Formulas relating to behavior and self-purification phenomena of streams become more involved with the increasing load and variety of organic and inorganic pollutants. Paralleling this is the ever-increasing need for water to sustain our expanding technology. This increasing need against fixed supply heightens the necessity for conservation. Water resources are more than ever a political issue. On the subject of water resources, certainly the sanitary engineer is at home. If he can balance his professional ability with public leadership, he will have the privilege and opportunity to see that these issues may be sensibly resolved in the public interest.

Sanitary engineering has progressed along many other fronts. Milk and food sanitation is a major activity consuming half the time and effort of sanitation personnel in community health agencies. The multi-billion dollar food industry, with its continually changing methods of production, processing, and handling, presents the sanitary engineer many opportunities for public service.

He has responded magnificently to the need for basic sanitation procedures. However, thus far, these services have applied largely to the food environment rather than to food itself. The primary objective has been to reduce danger of infection or poisoning. But with the development of a

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Mr. Hollis, assistant surgeon general, chief sanitary engineer officer, U. S. Public Health Service, Washington, D. C., presented this talk before the Symposium on Health and Human Engineering of the Centennial of Engineering in Chicago, Sept. 11, 1952. His talk is used by permission of the Centennial of Engineering, the collected talks of which are available in bound form from the Centennial, Museum of Science and Industry, Chicago.

positive view towards health, the tendency is growing to think of food less as a commodity and more as an essential to health. Nutrition is a basic environmental need. The health of two-thirds of the people in this room will suffer from conditions aggravated by their nutritional habits.

With regard to insect vectors, employment of sanitary engineers in research, development, and application of control techniques has produced historic results. Plague and yellow fever are now virtually of academic interest in this country. Even malaria, dengue, and typhus have become of limited concern. Recent developments of insecticides overshadow earlier findings. Techniques are being produced to permit an analytical approach to the study of insect behavior. Mosquito abatement programs have become a permanent part of health department operations. Even so, the current epidemic of mosquito-borne encephalitis in California has been a striking example of the continuing significance of insect vectors.

Closely allied to vector control is the field of refuse disposal. Except for improvements in the techniques of landfill, the sanitary engineer has neglected this subject. Admittedly, there has been a lack of public support. Recently public attitudes have changed. Areas suitable for landfill are becoming scarce, and there is increasing need for reclaiming or salvaging the organic content and other valuable fractions contained in garbage and refuse. Composting to produce a humus-fertilizer is for the first time attracting real interest in the United States. This same conservation awareness is evident in sewage treatment research. Studies are being directed toward reclaiming not only the water contained in sewage but also the fixed nitrogen. The time is approaching in the nation's history when we should begin to throw away less and less.

Other important fields of sanitary engineering include industrial hygiene, housing, air pollution, and the emerging field of radiological health. As to industrial hygiene, in addition to the obvious toxicological problems, the work in human engineering, noise control, and other factors must keep pace with industrial growth. All of these fields offer vast potentialities.

Interest in housing, indicated by the number of community health departments with organized activities, is only beginning to be explored. Because of its great effect on the total well-being of the individual, it seems certain that the housing hygiene will command greater attention. It will be the job of the sanitary engineer not simply to provide certain utility services for premises but to master an understanding of the complex relationship between the home and the family's health. We must not underestimate the importance of this relationship. It may well govern future community organization.

Interest in air pollution parallels industrial expansion. The paucity of information on this subject has opened up a vast new field of endeavor. All sources of discharge to the atmosphere —industrial processes, municipal incinerators, automobiles, burning of fuels and refuse, and the like—are being subjected to critical study and re-evaluation in terms of their chemical, physical, and biological effects. A closely related subject is that of airborne pathogens. Interest in defense against biological warfare is bringing about a new and rigorous analytical approach to this subject. These findings will be of great value to peacetime pub-

(Continued on Page 12)

Chemical Exposition Is Set for October

The 8th National Chemical Exposition —set for the Chicago Coliseum October 12-15—will also be a center for a series of important chemical meetings and other activities.

The list includes joint meetings with:

The Manufacturing Chemists' Association

The Chemical Market Research Association

The Society of Chemical Industry

The Purchasing Agents' Association

All will hold technical programs.

The Manufacturing Chemists' Association will present a symposium on packaging, transportation and labelling. The Chemical Market Research Association will present one on exposition marketing.

In addition there will be:

The Industrial and Engineering Chemistry Lecture series, conducted by the editors of Industrial and Chemical Engineering.

The meeting of the Chicago section of the American Chemical Society, at which Walter Reppe, famous German chemist, will speak.

A two-day workshop on chemical products in consumer goods, held in co-operation with the State Street Council and the Chicago Association of Retail Merchants, with an expected attendance of some 2,000 retail merchandising supervisors.

The Chemical Trail Blazers—an exhibit of new ideas in chemistry.

Chem-Phot-Ex—an exhibit of photographs by chemists about chemistry.

The Art Exhibit—an exhibit of paintings and other original works by chemists.

A special program for students from the Chicago area, through the National Science Teachers' Association, with guided tours of the exposition, and a program for college seniors and graduate students on "Your Introduction to the Chemical Industry."

The Chemical Industry Medal award dinner of the Society of Chemical Industry.

There is no substitute for the broad, intimate contact of trade fair marketing, which dates back to the Middle Ages. This year that contact is to be further augmented by extending the information transmitted among manufacturers right to the ultimate consumer through co-operation with retailers.

Jet Engine Noise Is Quieted by Hangar

Insulation of walls, roofs, hangar doors and windows is helping to exclude the racket of jet engine testing on runways outside Grumman Aircraft Engineering Corporation's huge new assembly plant, according to Engineering News-Record.

Situated on a 4,500-acre site on the Peconic River area near the east end of Long Island, N. Y., the plant is surrounded by heavily wooded, sound absorbing terrain, thereby minimizing the noise annoyance to nearby farms and residential areas. The company, however, realizing that the noise might disturb its own workers to the point of slowing production, felt that acoustical treatment was necessary to insure high-level efficiency, both from production and from office workers.

Major structures on the site include an assembly and administration building, hangar and operations building, steam plant, warehouse and paint shop, as well as two long runways (7,000 and 10,000 feet, respectively) for testing jet planes. The buildings alone enclose about 19,000,000 cubic feet of space and cover 527,000 square feet of floor area, the magazine says.

In general, windows were installed only where daylighting is desirable, such as in office spaces and the cafeteria area, although windows were placed along the ground floor of the assembly building for psychological reasons. In office areas and the control tower, the openings were double-glazed for additional insulation against noise.

In the control tower, double glazing consists of an outer pane of heat-absorbing glass and an inner pane of plate glass, separated by a four-inch insulating air space. Deep pile carpeting on the floor and an acoustic ceiling provide additional sound absorption.

Roofs of the main buildings consist of two-and-three-quarter-inch-thick concrete plank, topped with glass fiber insulation board and builtup roofing. The basic panel used in exterior wall construction is a precast concrete sandwich panel five inches thick, which not only meets the requirements for acoustical and thermal insulation but also saved considerable time and labor during construction. Most of the panels are about eight by ten feet, weigh two tons apiece, and consist of a glass-fiber-board insulation core sandwiched between two reinforced concrete facings. A total of 170,000 square feet of the panels were installed, at a cost of $2.97 per square foot, the magazine reports.

With buildings equipped with fixed windows and designed for operation with closed doors in order to exclude noise, provision of air conditioning in office and work spaces was essential. Because irrigation is very important for farms in the area, reduction of groundwater level was not desirable; hence, the air conditioning utilizes both well water and mechanical refrigeration, in a system which circulates the water and returns it to the ground through a recharge basin.

Your Pet Project MAY BECOME A PRIZE PAPER

Jot down the ideas you've had for a long time . . .

Maybe they'll help you think of others . . . Maybe they'll win you one of the five, $100 prizes

Here are the rules:

Any member of the Society may compete regardless of grade of membership.

Papers shall not be highly technical in nature. A clear, concise and interesting coverage is desired rather than complex formulae or derivations. The subject discussed should be of general interest to engineers but should not be of a political or highly controversial nature.

All members of the Society who wish to submit papers in this contest should contact the Secretary as early as possible and not later than February 1, 1955, and request a copy of the rules governing the competition and an outline of the minimum requirements for acceptance of papers. These cover in detail the mechanical make-up which should be followed in preparing and submitting papers for the contest.

Papers must be submitted to the Secretary for acceptance by April 1, 1955. If the Secretary finds that they meet the minimum requirements of the contest, he will forward them to the Awards Committee for review. The papers will be identified by number only. The Secretary of the Society is the only person who will maintain the key to the authors.

If any paper does not comply with such minimum requirements, the Secretary will so advise the author and discuss with him the points which are below the minimum requirements. The papers which are accepted will be forwarded to the Awards Committee for judging not later than May 1, 1955. Papers which have not met the minimum requirements by that time cannot be considered for prizes.

Papers which are accepted will be judged on originality of presentation, editorial merit and value to the engineering profession.

The papers submitted must not have been previously published in substantially the same form. No copyrighted materials shall be used unless permission has been obtained and so indicated. All manuscripts, drawings, etc., are to become the property of the Society and cannot be published without the consent of the Society.

If the papers submitted are NOT of sufficient merit to warrant the award of any or all of the prizes, the Awards Committee reserves the right to award less than the five established prizes or to postpone the competition.

The winners will be announced and the prizes presented at the annual meeting of the Society in June, 1955.

WSE Executive Secretary will furnish you with a complete set of rules and minimum requirements on request.

The Economic Feasibility of

The New York State Thruway

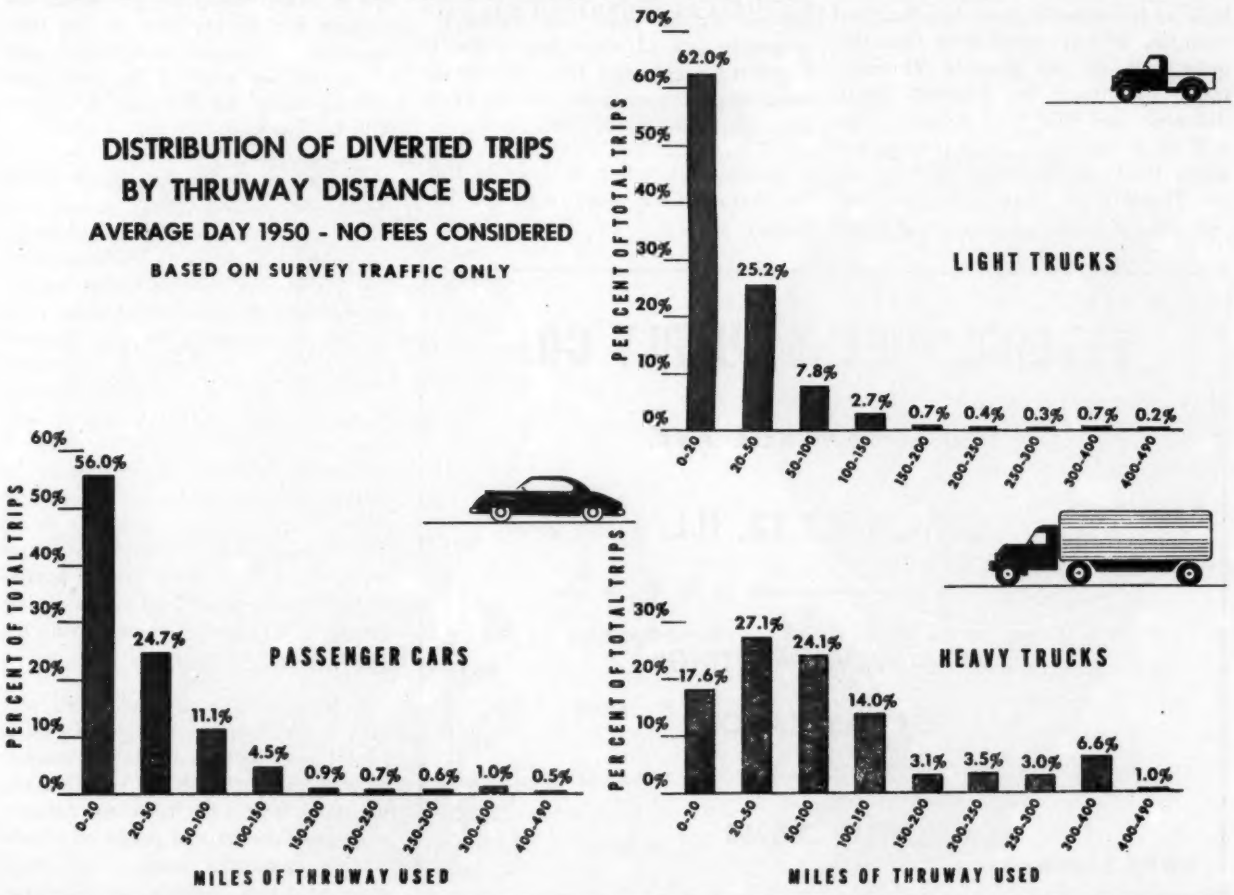
By Elmer B. Isaak

In March 1950 a committee of four state officials and two consultants recommended to the Governor that a new authority be established to assume responsibility for the financing, construction and operation of the New York State Thruway. At the same time it was recommended that the State constitution be amended to place the State's credit back of the Authority's bonds, thus effecting a saving in interest cost of many millions of dollars. These basic recommendations, and their subsequent implementation, laid the groundwork for the present Thruway program.

In creating the Thruway Authority and providing for the State guarantee of the Authority's bonds, it was necessary to fix a limit on the Authority's borrowing capacity. At the time, engineering plans had not progressed far enough to permit an accurate cost estimate to be made. Detailed plans had been prepared for only limited sections, and for most of the route the location had not yet been selected. On the basis of the general nature of the information then existing, the Department of Public Works arrived at a rough preliminary figure, taking into account construction conditions and cost levels of 1949. This procedure, which was the only one feasible at the time, led to the establishment of a $500,000,000 limit on the Authority's borrowing power.

Subsequently, in accordance with the

Mr. Isaak, A.M., ASCE, is a member of the firm of Madigan-Hyland, consulting engineers.



committee's recommendations to the Governor, the Authority was established and a detailed traffic and economic study was undertaken. This study crystallized the nature of the fees to be charged for the use of the Thruway, and presented the first comprehensive picture of the Thruway's revenue potential. It was based on one of the most comprehensive traffic surveys ever undertaken, during which vehicles were counted and drivers were interviewed on all the principal trans-state highways. Forty-nine check points were established, including 41 on main state highways, five on bridges and three on ferries. Over 1,500,000 vehicles were counted and nearly 400,000 questionnaires were answered — the bulk of them through roadside interviews.

Characteristics of Thruway Traffic

Analysis of the facts so obtained made possible an estimate of future Thruway traffic and also shed important light on its probable characteristics. For example, it was established that the great bulk of the expected Thruway traffic will travel for relatively short distances, and that long distance trips will be a negligible factor except for heavy trucking. Passenger car trips on the Thruway are expected to average only 34 miles; 80 per cent of all such trips will be for less than 50 miles, whereas fewer than 3 per cent will exceed 200 miles. These estimates are borne out by actual facts recorded in the Thruway traffic survey. Out of 194,562 automobiles counted on the main state highways during a typical weekday, only 150 were found to be traveling between New York City and Buffalo.

Light trucks show an even greater tendency toward short trips than passenger cars, but heavy trucking falls into a different category. The average heavy truck trip on the Thruway is estimated at 94 miles, but even in this class 83 per cent of all trips will be for 150 miles or less.

These distance figures emphasize the role of the Thruway as a series of sections connecting the adjacent population centers of the state, rather than as a high speed funnel channeling great streams of traffic from one end to the other. Every survey dealing with the subject for 15 years has shown the preponderance of short trip traffic in populated areas, and this will be the basic character of traffic on the Thruway.

Another interesting analysis of traffic characteristics dealt with the frequency of travel by Thruway users. Due to the proposal advanced for the issuance of an annual permit good for unlimited use, it was essential to determine the extent to which individual vehicles might make repeated trips on the Thruway. The basis for this information was a question added to the traffic survey interviews, "How many times a year do you make this trip?" The answers to this question produced some startling results.

Of the total annual passenger car trips considered divertible to the Thruway, it was found that 25 per cent of all these trips would be made with commuter frequencies, and that this 25 per cent of the total volume will be piled up by less than one-half of one per cent of all the different automobiles using the facility during the year. This becomes more comprehensible if one stops to realize that one steady commuter makes at least 250 round trips or 500 one-way trips a year. A further group of regular users, those making two or four round trips per week, will account for 15 per cent of the total passenger car volume, even though only about 0.6 per cent of the individual vehicles using the Thruway in a year will be involved.

In order to discuss the subject of trip frequencies more precisely, it was necessary to coin a term that would designate the trips made by a particular vehicle between two particular points, regardless of the number of times such a trip was repeated. The term applied was "vehicle run," and it represents a unit which can be mathematically computed from a trip frequency survey, whereas the number of different individual vehicles cannot actually be determined because it is not known how many different sets of points a single vehicle may travel between in the course of a year. A "vehicle run," then, applies to all the trips made by a single vehicle between the same two points during the course of a year.

In discussing trips made with very high frequencies, the number of vehicle runs nearly corresponds to the number of vehicles, since it is unlikely that any one vehicle will be traveling between more than one pair of points on a commuting basis. On more casual trips, however, a single vehicle can, of course,

make a large number of different vehicle runs.

Continuing the analysis of passenger car trip frequencies expected on the Thruway, it is found that those trips made with very few, if any, repetitions reveal characteristics equally as interesting as those of the commuters. Unrepeated trips constitute 14 per cent of the anticipated passenger car volume on the Thruway, but these represent a big 72 per cent of all the vehicle runs to be made during the year. Another 10 per cent of the passenger car volume consists of trips made from two to four times a year, representing 16 per cent of the vehicle runs. Nearly half of all trips will be made with frequencies in the middle groups of once a month to four times a week.

The significant point is that there will be a very large number of occasional users of the Thruway, but a disproportionately large segment of the traffic volume will be built up by a relatively small number of regular users.

Trucking traffic shows an even greater tendency to repetitive trips, with heavy trucks having a much greater concentration of trips repeated from one to four times per week.

A correlation between frequency and distance of travel was also revealed by the data. For passenger cars the average distance of trips made over five times a week was found to be only about 20 miles, but trips made only once a year averaged 170 miles in length.

Utilization of the basic traffic facts afforded by the origin and destination survey made it possible to arrive at well-founded estimates of traffic considered divertible to the Thruway. The methods used were both painstaking and time consuming, and are not readily susceptible of detailed description here. Suffice it to say that due consideration was given to the usual factors of comparative time and distance, competitive

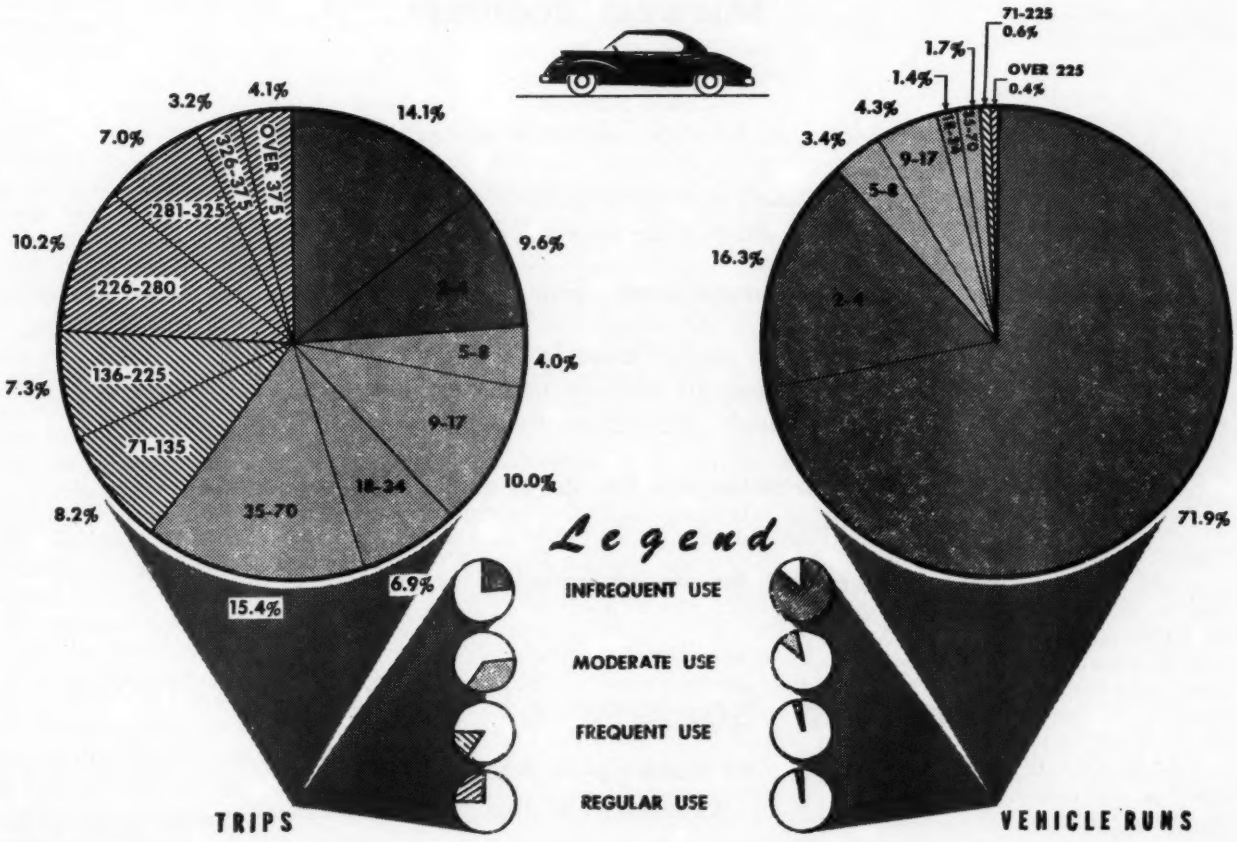
(Continued on Page 15)

TRIPS AND VEHICLE RUNS DIVERTED TO THRUWAY

BY TRIP FREQUENCY GROUPS - NO FEES CONSIDERED

PASSENGER CARS - YEAR 1950

BASED ON SURVEY TRAFFIC ONLY



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84 E. Randolph Street
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Operations Research Offers Advantages

Operations Research — application of the scientific method to the problems of military, government and business management — offers many advantages to the engineer, Chemical Engineering, McGraw-Hill publication, says. A fairly recent field, it is receiving increasingly prevalent application to broad business problems.

The principles and practices of Operations Research are not new, in that it actually is the application of research at the operations level. It takes the scientific method of research out of the laboratory and into the board room to give top level administrators a quantitative basis for management decisions. Where OR has been intelligently applied, it has resulted in a more effective use of available facilities, the magazine reports.

This technique can be applied to basic, but difficult, business decisions, such as choosing the right time for a salesman to contact an account; how and where to spend the advertising appropriation for best results; or a production scheduling or inventory problem. In such cases, the magazine points out, the scientific approach, abetted by the mathematical techniques developed by operations research men, can come up with a better understanding of the facts underlying the problem and will aid management in making its decision.

Because an OR man must be a scientist in a sense, the field is particularly well suited to engineers, who already are familiar with the science of gathering facts, seeking the fundamental relationships which lie behind those facts, and evaluating the results of various courses of action. Major requisites for the job are a keen, observant mind, courage to tackle big and tough jobs, and a great deal of curiosity; ideally, the magazine says, the OR man combines creative ability, common sense, and some understanding of human relations. Technical knowledge of the particular industry involved is not nearly as important as the proper mental and personality characteristics.

In most companies, the OR group occupies a staff position well up on the company organization chart, acting in an advisory position to one or more decision-making executives, and handling broad problems which are of vital concern to the entire company. Salaries for OR men are good, ranging from $12,000 to as high as $40,000 per year for a top man, the magazine reports.

Council Confronts Nuclear Problems

To meet "the pressing problems of nuclear engineering and the related sciences", with particular interest in "industrial usefulness", Engineers Joint Council, composed of major American engineering societies with a total membership of 170,000, announced on Aug. 1 initial steps toward an organized program of confronting these problems "authoritatively by a group of leading engineers."

In making the announcement, Thorndike Saville, president of the Council and dean of engineering at New York University, commented that "action by this powerful engineering group is furthur evidence that nuclear energy is well on the way to having important peace time industrial usefulness."

An early invitation will be extended to the societies of physicists and chemists to join the engineers in planning a strong organization, it was reported by Warren L. McCabe, administrative dean at Brooklyn Polytechnic Institute, chairman of Engineers Joint Council Committee on Recognition of Specialties in Engineering. The movement is expected to bring together most of the country's eminent participants in industrial nuclear development.

Although organization of the new group is in its initial stages, a national convocation in 1955 is contemplated for discussion of the subject of nuclear development for industrial use.

The announcement was as follows:

"The pressing problems of nuclear engineering and the related sciences are to be dealt with authoritatively by a group of leading engineers.

"In this announcement, Thorndike Saville, President of Engineers Joint Council, is joined by Daniel V. Terrell, President of the American Society of Civil Engineers; Leo F. Reinartz, President of the American Society of Mining and Metallurgical Engineers; Lewis K. Sillcox, (MWSE), President of The American Society of Mechanical Engineers; Alexander C. Monteith, President of the American Institute of Electrical Engineers; Chalmer G. Kirkbride, President of the American Institute of Chemical Engineers; Dale L. Maffitt, President of the American Water Works Association; William E. Blewett, Jr., President of the Society of Naval Architects and Marine Engineers, and Nathan W. Dougherty, President of the American Society for Engineering Education. Under the general policy of Engineers Joint Council to encourage the close cooperation of specialists in engineering, a strong joint agency will be set up to organize the cooperation of all engineering groups and related scientists to develop discussions of nuclear engineering subjects and to deal with the publication of worthwhile papers and addresses.

"The total membership of the federated societies known as Engineers Joint Council is about 170,000. The membership includes several thousand skilled engineers who are working on the critical problems of mining, processing and the use of all the materials involved in the production of energy by fission.

"Action by this powerful engineering group is further evidence that nuclear energy is well on the way to having important peace time industrial usefulness."

As to the likelihood of an invitation to others to join the engineers' program, Dean McCabe said:

"We agree as to the desirability of bringing in the physicists, chemists and perhaps other related groups, but at the moment our responsibility is largely in the engineering field."

Terrell is dean of engineering, University of Kentucky. Reinartz is vice-president of Armco Steel Corp., Middletown, O.; Sillcox, MWSE, is honorary vice chairman of the Board of New York Air Brake Co.; Monteith is vice-president of Westinghouse Electric Corp., Pittsburgh; Kirkbride is president of Houdry Process Co., Philadelphia; Maffitt is general manager of the Des Moines Water Department. Blewett is president of Newport News Ship Building Co.; Dougherty is dean of engineering, University of Tennessee.

Sanitary Engineer

(Continued from Page 4)

lic health programs. It is precisely the type of data needed to aid engineers in controlling the air much as they now control water.

With respect to radiological hazards, sanitary engineering activity is in its infancy. Even so, exposure to radiation today from medical diagnosis alone is at least ten times as great as total lifetime exposure fifty years ago. Research is underway on the treatment of radioactive wastes, the removal of radioactive materials from water supplies, and the behavior of radioactive substances in streams and in air. State health departments are adding to their staffs engineers trained in radiological health. This field imposes on the sanitary engineers a complete new set of formulas, terms, dimensions, and concepts.

Present Scope of Sanitary Engineering

In its evolution, sanitary engineering development has followed the pace of technology. Early in the century, development of community water supplies and disposal of liquid and solid wastes were the paramount problems. The urgent need of the time was to suppress communicable diseases. In fact, in the public health movement, the past half-century might be termed the era of germ disease control.

Environmental problems of the next half-century promise to be much more complex. The chemical environment—the impact of the chemical age—on the four fundamentals, air, water, food, and shelter—likely will become of major significance. The impact on health of the emerging atomic age and all of its potential problems are yet to be diagnosed. Even in the realm of microorganisms, a full understanding of viruses as related to environmental facilities remains to be delineated.

Not to be ignored either is the rate, the pace, the speed of the developing technology. Developments measured in the last half-century by decades are now measured by years. We speak of the 700 per cent increase in industrial production since 1900 without realizing that more than half of this increase occurred in the past ten years. Chemical production today is three times as great as in 1936. Gone are the days when sanitary engineers could delay action on problems until public opinion crystallized. In the new age of rapid change, the sanitary engineer must influence public opinions and affairs in his field in anticipation of these events.

The new state of affairs brings concrete meaning to the concept of the sanitary engineer as he has seen himself. Even in the days when sanitary engineers were concerned only with the treatment of water and disposal of waste, their profession was identified with environmental control. Their success with water fortified hopes for control of the other environmental factors. Today, the sanitary engineer is forced to face up to the problems of environment in all of its phases and all of its complexities. Many of these problems require not only engineering training but training in an extraordinary number of other disciplines. In practice, the modern sanitary engineer is a combination engineer-chemist-biologist-economist-sociologist. He must be a composite of these to an extent far greater than is required by any other branch of engineering. The requirements are becoming so severe that the sanitary engineer needs to take stock of himself. Unless he lives up to the criteria he has established for himself, the concept of the sanitary engineer as we define it today will eventually disappear, and the role of the sanitary engineer may once again be relegated to pipes and drains. The boldness with which the profession faces up to this issue will be the gauge of its true stature.

Development of Sanitary Engineering Research

In the early development of sanitary engineering programs, basic research was by-passed in favor of applied research. Most of the work was conducted by the sanitary engineer himself. The funds available were so limited that only a few research scientists could be attracted to the field. They found employment in other areas, like petroleum research, and of course, scientific advancement in these areas forged relatively far ahead. Meanwhile, the sanitary engineer was obliged to solve his own problems, and, in retrospect, he did so with surprising success. Further advances will require a much more fundamental, and far more expensive approach. For example, consider the trickling filtration process used in sewage treatment. This has been improved to a high degree of engineering efficiency, but actually within basic knowledge as to the fundamental biochemical reactions. We know that the filter teems with all sorts of organisms, but we do not know which organisms are doing the work. Theoretically, biological stabilization could be accomplished with greater efficiency through a more con-

trolled process. The sewage materials would be acted upon only by a selected organism or group of organisms reproducing in an ideal environment. The work of Humfeld in converting organic wastes to mushroom cells in a few minutes time gives an idea of the sewage treatment plant of the future.

The problem of algae in water treatment is another instance where we have reached a dead end for lack of basic knowledge. We can expect to gain little additional knowledge from scattering copper sulfate in reservoirs until we understand the symbiosis through which the algae produce tastes and odors.

Although sanitary engineering research has been concerned primarily with practical applications, nevertheless, the sanitary engineer can claim credit for important basic findings. By way of examples: (1) the development of the flocculation process for removing suspended materials from water, an achievement in the field of colloidal physics and chemistry; (2) the development of the broth-fermentation culture tube method for statistically evaluating bacterial concentrations in water, a fundamental advance in bacteriology; (3) development of residual spraying techniques for control of disease-transmitting insects, an outstanding contribution in entomology; and (4) development of processes for minimizing scaling in the boiling seawater of vapor-compression distillation units, an advance in inorganic chemistry.

Public Health Today

The so-called wonder drugs are broadening modern public health. Also contributing to the broadening process is an appreciation of the profound importance of the interrelation between man's health and his environment.

The environmental factor is evident in the new public health programs in chronic disease control, nutrition, and problems of aging, as well as in the fields already mentioned. Environmental factors—the engineer's realm—bear an intimate relation to chronic diseases. Today we are moving toward a concept of "health maintenance" wherein personal medicine and preventive medicine are closely integrated. If he has the capacity and competence, this movement will give the engineer increasing prominence on the public health team.

Challenge of the Future

This hasty survey of the past and present role of the sanitary engineer in public health has covered familiar ground. May I explore outer space now with a few thoughts of his potential role to come, in world health, atmospheric conditioning, the chemical environment, radiation, and energy engineering. These challenges place the sanitary engineer at the threshold of a new era. But he needs a broader background in science, and in the humanities to help him to shoulder these new responsibilities.

World Health

This summer, in Chicago, the spokesmen of the two major political parties emphasized the world-wide responsibilities of our Government. In essence, they issued a statesman's challenge to the engineering profession in general, and to the sanitary engineer in particular. Those of you who have been associated with foreign programs in undeveloped areas know that improvement of the environment to suppress health hazards is fundamental to their economic advancement.

The concern of the sanitary engineer in international health will grow, too, as international travel grows in volume and in speed. Travel accelerated by jet turbines and rockets introduces a significant factor in health problems among the world's peoples.

Atmospheric Conditioning

Investigations of the atmosphere have been limited for the most part to air pollution by dusts, fumes, mists, and pollens. Conditioning of the outdoor atmosphere may include control of precipitation as well as control of physical, chemical, and bacterial pollutants. A beginning towards complete atmospheric conditioning has already been accomplished within the home. The status of this development is comparable to that of central heating in 1900.

Smog or atmospheric pollution is at present generally thought to be confined to a few industrial centers such as Pittsburgh, Detroit, and Los Angeles, or to specific conditions as encountered in Trail, British Columbia, and Donora, Pennsylvania. The fact is that air pollution is significant in most industrial areas.

The true effect of atmospheric pollution on the public health of a metropolitan area is virtually unknown. The evaluation of the relationship, if any, between pollutants such as coal tars and other hydrocarbons in the air and the increased incidence of chronic ailments such as lung cancer will require prolonged study.

The Chemical Environment

Some of the new synthetics, when discharged to streams, produce serious tastes and odors even when measured in dilutions of a few parts per billion. Certain chemical reactions may also produce serious effects on aquatic life. Compounds in cosmetics and clothing create new and unevaluated environmental influences on the skin. Other compounds, incorporated into foods, introduce new elements into the diet. We have already noted the problem of chemicals in the atmosphere. The term "chemical environment" is coming into use to summarize the significance of the products and by-products of industrial chemistry. As yet unknown is the chronic effect of this increasing chemical exposure. From the toxicological point of view, the additive and synergistic effects compound the problem.

Radiation Wastes and Hazards

No less difficult are the potential problems associated with atomic energy, including nuclear power development. The advent of nuclear power will create problems that sanitary engineers must be prepared to meet. The keel of the first atomic powered submarine has already been laid.

Nuclear reactors present two health hazards: radiation from operation, and radiation from waste products. The operating crew and others nearby must be protected from excessive exposure, and the radioactive wastes must be safely handled. The sanitary engineer must think of both problems but the disposition of the radioactive waste will be by far the more important and the more difficult. Informed scientists and engineers agree that radioactive wastes may be the limiting factor in industrial utilization of atomic power. One method of solving this problem would be to find some means of utilizing the mixed fission products. This field is wide open for the application of sanitary engineering principles.

The epidemiology of radiation needs

clarification. In general, we know some of the cumulative effects of radiation, and a great deal is known about measurement of external exposures. Not too clear as yet are techniques for evaluating life-long accountability of total exposure. And we have yet to develop a measure of dosage in living tissues that will make possible the prediction of specific changes.

Energy Engineering

As you know, there is a school of thought that looks beyond the atomic age. There is a new concept that eventually may have a great impact on our profession. Those concerned about the wholesale application of atomic power as a prime energy source have watched with extreme interest the considerable study and stock-taking of the world's long term energy resources. I am informed that atomic energy or nuclear fuels may at most be a stopgap or interim solution. Even before our supply of fossil fuels (coal, oil, gasoline) nears exhaustion, nuclear fuels may give way to the direct use of solar energy.

Solar energy may be concentrated by one of several methods: either through physical, chemical, or biological capture. Of these, biological utilization through photosynthesis for the production of food or chemicals is especially promising. This field is already within the province of sanitary engineering. An example is the utilization of solar energy and sewage in the mass culturing of algae to produce a high protein animal food supplement.

Challenge to the Sanitary Engineering Profession

In describing the manifold spheres of activity and responsibility of the sanitary engineer, I have noted the role of the sanitary engineer as a member of a team.

In early days, the sanitary engineer may have been the only man on the team, or at any rate, one of only a few. Today, however, the environmental team is composed of representatives of many scientific and professional disciplines. The sanitary engineer, as the name implies, is the engineer of the team. If he has the capacity, imagination, and perspective, he will continue to be the individual responsible for the coordination, guidance, and direction of the group activities.

It will not be easy for the sanitary engineer to grow up to his potential responsibilities and opportunities. What can he do to improve his capacities, to broaden his perspective, and to strengthen his influence? Several practical recommendations have been made within the profession. One suggestion is that education and training should be longer and more extensive. It has been proposed that experiment stations be set up at universities as a phase of extended education. Another suggestion is that sanitary engineers should have a strong professional society which would promote performance standards within the profession, act as a national spokesman for all sanitary engineers, and apply the influence of the profession more widely.

However, I think that these measures will be of little avail unless more sanitary engineers, as individuals, demonstrate capacity for public leadership—leadership that at other stages of history, gave prominence and prestige to the lawmaker, the scholar and teacher, the explorer, the merchant, and the doctor of medicine. At one or another period of history, these various groups gained respect because they satisfied needs of society. In this modern age, society needs the engineer's contribution. Society needs more than his technical services. Society needs educated engineering minds that can apply technical principles wisely. What has happened in the field of municipal planning is an example of the failure of the engineering profession to recognize trends of the times. Unfortunately our own discipline shows signs of similar deficiencies. Sanitary engineers must demonstrate to society the benefits that can be attained through environmental controls.

Conclusion

In closing, I should admit that in this presentation I may have given the impression that the sanitary engineer is an indispensable figure in public health. Conceivably you may have inferred a portrayal of the future sanitary engineer as a rigorously trained and socially responsible leader, an executive, diplomat, and statesman. I may have given the impression that the discipline requires a competence and capacity not normally demanded of a single profession. If I have given you that impression, may I hasten to assure you, that is exactly what I intended.

Edison Is Honored

A unique illuminated sign has been put in operation by Commonwealth Edison Company to honor Thomas Edison's invention in 1879 of the first commercial incandescent lamp.

It is a specially designed spectacular, which has been mounted at the second and third floor levels of the Edison building at the corner of Clark and Adams Streets.

It is one of several features planned for Light's Diamond Jubilee which is being observed this year. It will operate throughout 1954 from 7 a.m. to midnight each day.

It consists of a huge revolving light bulb twelve feet high and six feet in diameter. The bulb is covered with a myriad of small mirrors each two inches square. Lights play on the lamp as it revolves to give the appearance of a jewel-studded bulb.

According to Federal Sign and Signal Corporation, the builder, the display is the only creation of this type.

New York Thruway

(Continued from Page 9)

highways, the advantages of an uninterrupted route with expressway standards, safety and other features entering into the choice of a route by a driver. Seasonal and daily variations in traffic were considered to expand the survey results to an annual basis.

Thruway Toll System

Particular attention was paid to the toll aspects of the Thruway, both from the standpoint of establishing reasonable levels and types of fees and from the standpoint of developing a practical system of collecting such fees. It was not the objective to charge all the traffic will bear, but rather to produce a revenue from the users of the Thruway which will enable the project to support itself.

A new element in the toll picture was the proposal for an annual permit, to be sold for a lump sum, which would be good for unlimited use of the Thruway during the year. This system affords the regular user a travel bargain, and it also attracts to the facility some traffic which would not otherwise use it. Investigation showed, however, that the permit system could not be applied to trucks, as it was impossible to fix a fee that would be fair to all trucks and still produce the necessary revenue for the Thruway. Many individual trucks on the Pennsylvania Turnpike pay aggregate tolls of a thousand dollars or more in the course of a year. Obviously it would be impossible to set any such amount as a permit fee, and yet in order to secure adequate revenue from regular heavy truck users a fee of that magnitude would be required. This would be out of the question, so the permit scheme was eliminated so far as trucks are concerned.

Annual permits will be available for private passenger cars registered in New York State. The rate recommended by the Engineers, though not yet adopted by the Authority, is $10 per year. Permits will entitle the holders to use the Thruway as much as they please without extra charge, except that a minimum toll of 25 cents will be paid by all vehicles for crossing the Hudson River Bridge located at Tarrytown.

Vehicles which do not hold permits will pay for each trip at rates varying with the type of vehicle and distance traveled. The tolls will be comparable with those on existing turnpikes, and will be collected principally at the exit interchanges. The rate recommended by the Engineers for passenger cars is one cent a mile.

Upon entering the Thruway, drivers will pick up a toll ticket showing their vehicle class and point of entry, and at the exit they will surrender the ticket and pay the proper toll.

In the areas near New York City and Buffalo, tolls will be collected at a few barrier-type stations instead of at interchanges. This method was considered more suitable in these heavily built up areas because the interchanges will be very close together and the cost of building collection facilities and maintaining them at every exit was considered excessive. Some free use of the Thruway for very short trips will therefore be permitted in these areas, but the revenues lost are considered to be less than the costs of collecting them. The barrier type of toll collection is feasible in these sections because they happen to be at the ends of the system. Continuation of the barrier system throughout the length of the Thruway was not considered desirable, however, because of the excessive number of stops that would be required of long

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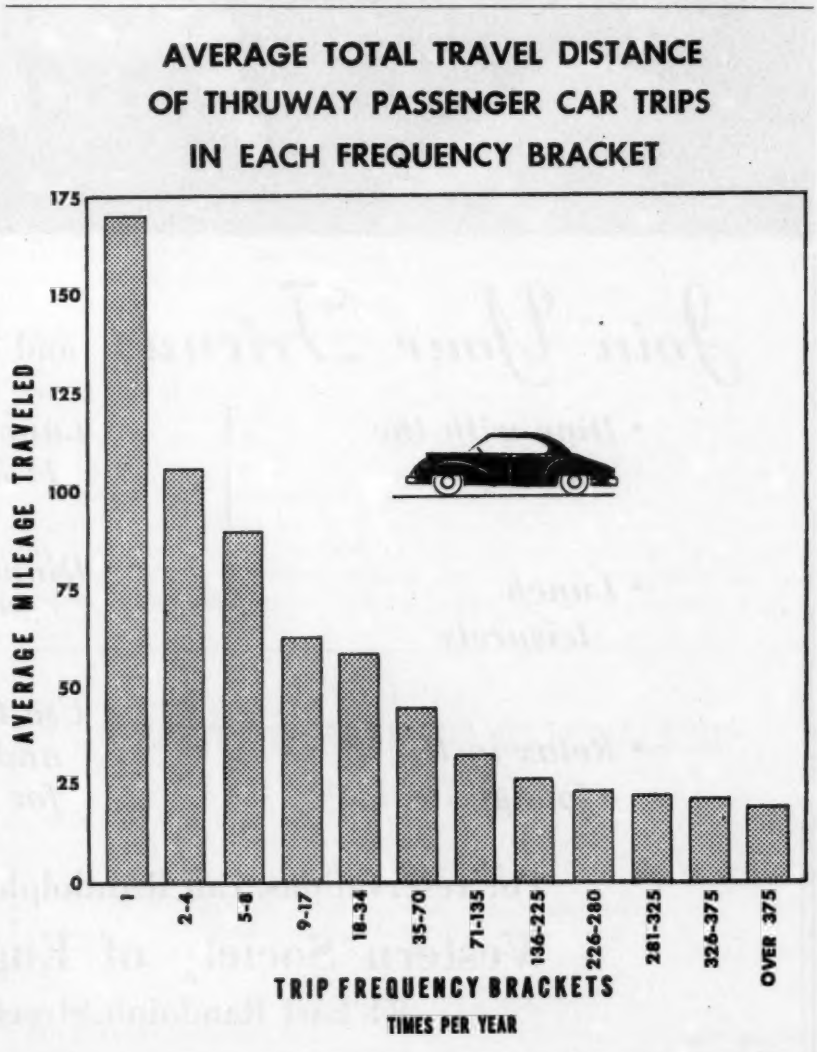

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Western Society of Engineers

84 East Randolph Street

New York Thruway

(Continued from Page 15)

distance travelers, and also because revenue losses would be excessive.

Very close attention was paid to the development of the most foolproof toll collection system that could be devised, and we believe that major advances in the art have been made as a result of more than a year's intensive research in this field. The equipment now being manufactured is almost revolutionary in some of its concepts, but this is another story in itself.

On the basis of the toll collection framework adopted, various rates of toll and their effects on traffic were studied. Particular study was given to the monetary savings available to trucks because of the superior type of artery, and a rate schedule was proposed based on operating savings resulting from only three things; reduction in fuel cost, reduction in vehicle maintenance cost, and reduction in tire wear. All the savings accruing to trucks because of time savings, increased utilization of equipment, heavier loads and the possibility of turn-around trips will be in the nature of a bonus to the truckers. The truck tolls recommended as a result of these studies were 1.0 cent a mile for light trucks and from 2.0 to 5.0 cents a mile for heavy trucks. These rates are slightly lower than those in force on the Pennsylvania Turnpike.

Taking the recommended level of tolls into account, the final estimates of Thruway traffic were developed. These estimates reflected not only the vehicles expected to be diverted from existing arteries, but also included the effects of increased travel resulting from the existence of the Thruway project. Careful estimates were developed of probable future trends affecting Thruway traffic volumes, including the growth of population and motor vehicle registrations, and annual volumes were projected for a period of years into the future.

Traffic and Revenue Estimates

For the first full calendar year of Thruway operation between New York and Buffalo, 1955, the estimated traffic volume is 34 million trips, of which 14 per cent will be commercial vehicles and the rest passenger cars. Out of 29 million passenger car trips, 20 million are expected to be made on permits, but the number of annual permits sold may not exceed 200,000 in the early years.

If recent precedent is followed and no serious economic disturbance occurs, a very rapid growth of traffic should be seen over a period of ten years following the opening of the Thruway, even without giving consideration to possible extensions of the system. For purposes of estimating, a conservative growth factor of 45 per cent in ten years has been used, but the growth rate of truck traffic is expected to be substantially greater than that of the passenger cars, so that commercial trips will account for about 19 per cent of the total traffic by that time.

By applying the recommended rates for fees and charges to the estimated traffic, the prospective gross revenues from tolls have been determined. These estimates range from $19,000,000 in the first full year to a level of $35,000,000 ten years later. Commercial vehicle toll revenues constitute some 62 per cent of the total to begin with and progressively increase until they reach 72 per cent of the total in 1965. The key note of trucking traffic in the Thruway financial picture is evident.

One reason for passenger cars contributing only about 35 per cent of the revenues, even though they constitute some 85 per cent of the trips, is the extraordinary travel value offered by the annual permit. Nevertheless, the permit plays an important role in Thruway financing. They are available to any resident of New York State owning a passenger car, which means to State residents in general. In November, 1951 these residents approved a referendum placing the credit of the State behind the bonds of the Thruway Authority. This action made possible a saving of over $120,000,000 in interest charges on Thruway bonds, and the Authority feels this has justified the bargain which permit holders will get.

Thruway Financing

The State guarantee has, of course, been the principal security behind Thruway financing to date. An initial issue of $60,000,000 guaranteed notes was sold at an interest cost of 1.1 per cent early in 1952, and a total of $250,000,000 in serial bonds has been marketed this year at an average interest cost of 2.67 per cent. This is from three quarters of one per cent to one per cent lower than would have been obtainable for revenue bonds marketed at the same times.

While the purchasers of guaranteed bonds look to the State guarantee for security, the State looks to the Thruway Authority and the revenues of the Thruway for protection against having to fulfill its guarantee. The economic survey has shown that the Thruway is a solvent project, and that its revenues will provide for operating and maintenance expenses and still leave enough to cover interest and amortization payments with an ample margin of safety.

One factor in the economic picture which has not yet been mentioned is the revenues to be available from concessions on the Thruway. Service stations and restaurants will be provided at reasonable intervals and leased to operators on a competitive bid basis. Several brands of gasoline will be of-

fered at alternating stations, and the Thruway Authority will receive a gallonage royalty on sales. The restaurant operators have already been selected. These will be three different operators on three sections of the route, and payments to the Authority will be based on a percentage of gross sales. Revenues from these sources will add a considerable sum to the annual income of the Authority.

Accomplishment of the Thruway has not been without its problems and difficulties. Actual costs have in many instances turned out to be higher than they were supposed to have been on the basis of preliminary figures. Some features have had to be curtailed and others modified. But the project has been able to go forward within a remarkably short time because it was founded on a sound economic basis. First, it was placed under a separate authority with its own powers to market bonds, collect revenues and administer its affairs as an independent agency. Second, it obtained a state guarantee of its securities, which saved many millions of dollars in interest cost and assured a ready market for its securities. And third, the project was placed on a firm self-liquidating footing by ascertaining its revenue potential as closely as engineering methods can measure, and establishing a system of charges adequate to pay its costs with a reasonable margin to spare. This job of financing is still going on, but with the firm basis that has been laid it is possible to keep a constant check on changes that may affect the economic picture and to take such measures as are necessary to cope with them.

End of Road?

An irate chief engineer was inspecting a stretch of newly built road, accompanied by the foreman in charge of the gang.

He pointed out to the bewildered foreman that the shoulder beds were off, that the curves were banked wrong, that the foundatin was not right, that the leveling was far from perfect.

Finally, after the avalanche of criticism, the old foreman spat on the ground, gave his superior a bland look, and asked: "Well, how is it for length?" —*Pure Oil News.*

New Use Is Found For Bulletin Board

For companies or company departments without house organs, the retirement of employees generally passes almost unnoticed.

The problem for such organizations, according to C. C. Hilchie, employment manager at Rollway Bearing Company's Maltbie plant, Syracuse, New York, is distributing in advance more information about the retiring employee—facts about him that emphasize what his worth to the firm has been. Hilchie thinks that men in the same departments often work side by side for years yet never really know one another.

Hilchie recently tested this theory. At the end of 1954, 16 Rollway employees will have reached retirement age. To acquaint their fellow-workers with the fact that they would soon be leaving, Hilchie wrote brief biographies of each retiring employee. These statements contained such information as family and job backgrounds, hobbies, and travels, and were posted monthly—one biography at a time—on plant bulletin boards, along with a photo of the person.

Response to the biographies has been excellent. Mostly skilled machinists or heat treat operators, Rollway employees have learned that the biographies disclosed how often their co-workers practised highly diverse occupations before entering industry. One had been a farmer, another a logger, a third a barber.

These bulletin board biographies have served as ideal substitutes for conventional house organ personnel stories, setting the stage so that when the day for them to retire takes place, everyone at Rollway will know of it—and can express their appreciation to the retiring employees accordingly.

Erection Is Begun On Prestressed Bridge

The first Chicago area prestressed concrete bridge was begun in DuPage County on Mack Road, three miles south of West Chicago and one mile south of alternate 30, on Wednesday, August 18, 1954.

The three pier, two lane, 120 foot bridge will be constructed of thirty-six pre-tensioned prestressed concrete reinforced beams, each being 3 feet wide, 17 inches thick and thirty feet long.

To form these beams ¼ inch diameter special high strength strand manufactured by American Steel and Wire Division of U. S. Steel are tensioned at 240,000 pounds per square inch within forms. The strands are then encased in poured concrete. Bonding properties of the strand with hardened concrete keep the strands permanently stressed, transmitting the high strength of the strands to the concrete.

The beams are being manufactured by the Midwest Pre-Stressed Concrete Company, of Springfield, Illinois, while the building of the bridge will be handled by the Advance Construction Company of Hinsdale, Illinois.

Three main advantages to this type bridge are the reduction of maintenance costs, durable construction and for the economic reason that the beams not only form the structural members of the bridge but the bridge decks as well.

On Training —
Letters from Leaders

In the last issue of Midwest Engineer we published another of about thirty letters received from leaders of Chicago-area firms concerning shortcomings noted in the engineers in their employ. Many of the letters also suggested what the engineers should do to correct their deficiencies.

Significantly, the engineer's technical training is generally considered adequate. In the broad area of Human Relations, however, engineers seem often to be "under achievers," according to the viewpoint of the industrial leaders as reflected in their letters.

We are printing another of these letters in this issue, as we shall do in future issues. Although the letters may be of greatest value to the younger engineers, we hope that all of the engineers who read them will benefit.

Here, then, is the next letter:

Dear Sir:

Please refer to your letter of August 31 regarding the educational needs of engineers.

It is my belief that there is a very real difference between some of the capacities which a man must have and exercise if he is to be rated as a good engineer and some of those which he needs and uses if he is rated as a good executive. A good engineer of necessity must be well-grounded in the basic courses of engineering whereas a good executive need not be so grounded unless he is largely concerned with engineering operations. It frequently has been said that the engineering curricula in most schools do not provide sufficient training in cultural and business subjects. I believe that the consideration back of this criticism resides in the fact that engineers are engaged in a great many activities which have little to do with engineering as we commonly think of it. In my opinion the only satisfactory way to remedy the situation is to provide additional training and not to substitute non-technical for technical subjects.

I think that engineering work of a strictly technical nature can utilize a somewhat greater range of personalities than appears suitable for executive work. In both types of work there are certain qualifications which appear to be innate rather than acquired. The effect of training and experience is simply to polish and expand these qualities and not to aid the man in acquiring them. A good engineer may make a good executive but it is not solely by his engineering training. There are additional requirements. Among these the following may be mentioned. He must have a personality which enables him to sell his capabilities to others, and in particular to impress others that he is capable of accepting and discharging responsibilities greater than those which he presently has. Further, he must be willing to take whatever responsibilities are placed upon him. It is desirable and frequently very necessary for him not only to take an interest in but actually to have a strong desire to do administrative and executive work. An engineer who is engaged primarily in the technical aspects of his profession is largely concerned with things.

On the other hand, if he is to be a good supervisor and ultimately a good executive he must also concern himself increasingly with people. The deficiencies which an industrial leader may see in his engineers may be either those due to inadequate training or due to a lack of innate qualities. The executive can do little or nothing about the latter, though by judicious placement of his men he can either minimize the need for or strengthen these qualities. If the deficiencies, however, are of an educational nature he can suggest or even provide opportunities for additional training. It is not apparent to me that there are any broad deficiencies in engineers as a group. Deficiencies must be considered in terms of specific individuals. A great many industries make an extensive study of job requirements and an intensive effort to place their employees in types of work which are best suited to their capabilities and interests. In other words, the effort is made to utilize the employees' capabilities rather than to criticize his deficiencies unless these deficiencies are a matter of habit and acquirement.

There is no doubt that there are many engineers who have innate qualifications for administrative and executive leadership and who could profit by opportunities for more business and even cultural training. I would agree that a program to enable such people to broaden their capabilities is very much worthwhile. This observation need not be limited to engineers only.

I feel that we are particularly fortunate in the Chicago area in having a considerable number of institutions which at present offer a wide variety of programs of outside study, including night courses. No doubt you are taking this into account in your consideration of the matter. I know that some of our own people, including some of our engineers, are at the present time utilizing these opportunities for broadening their education and their capabilities.

I hope that my reply to your letter will be of some help to you.

Yours truly,

Display Plant Model

North American Aviation Company will place on display, at the Instrument Society of America's forthcoming First Instrument Congress and Exposition, a scale model of an atomic pilot plant. The Exposition is being held in the Philadelphia Convention Hall from September 15 to 21, 1954.

North American has designed an atomic power generator and is prepared to build a pilot plant for $10 million to demonstrate and study the production of electrical power for industrial uses. The proposed pilot plant will generate about 8,000 kilowatts of electrical power, enough to supply 2,000 average homes with electricity.

The display—for which arrangements have been made by T. Vorburger of the American Institute of Physics—includes a cross section of a nuclear reactor and an attached steam turbine.

Engineering Societies Personnel Service, Inc.

New York Chicago Detroit San Francisco

These items are from information furnished by the Engineering Societies Personnel Service, Inc., Chicago. This SERVICE, operated on a co-operative, non-profit basis, is sponsored by the Western Society of Engineers and the national societies of Civil, Electrical, Mechanical and Mining and Metallurgical Engineers. Apply to ESPS, Chicago and the key number indicated. Prepared ENGINEERS AVAILABLE advertisements limited to 40 words, with typed resume attached may be submitted to ESPS Chicago by members of Western Society of Engineers at no charge.

OVER THE MANAGER'S DESK

Labor Day is the end of vacation periods, tumbling weeds, and the 1st smell of burning leaves. THAT is September. Are you going to be like the tumbling weed and allow your plans for expanding your engineering department be blown to the four winds, or are you going to realize that vacations are over and we all have a good work period ahead of us? Now is the time to contact our office for that particular engineer you are looking for.

If you are an engineer who has now seen the smoke from your leaves of experience beginning to shape up into definite progress, maybe you should realize that vacation is over and you should contact us to help you better yourself. B. A.

C-2075 WELDING SALES ENGR. EE Age up to 39 (tops) 1 plus yrs. exp. in industrial sales or application of welding products. Know: electrical welding eqpt. Duties: sell full line of welding eqpt. for well known manufacturer getting into the field with new line. For manufacturer of electrical equipment. Salary $400-$525 mo. Travel 20% of time. Car required. Location: Chicago headquarters.

C-2076 CERAMIC ENGINEER 5 plus yrs. exp. in glazed tile or terra cotta laboratory or research work. Knowledge of glaze controls. Duties: in laboratory making tests of various glazes, raw materials, and supervising control of tunnel kiln operations. For a terra cotta manufacturer. Salary: $6000-$7000. Employer will negotiate fee. Location: Chicago.

C-2077 CHEMICAL ENGINEER. Chem. or Chem. Eng. Age: up to 50. 3-5 yrs. exp. in research and development of foam rubber (latex or other products). Knowledge of synthetics helpful. Duties: research and development work in foam rubber and similar products. For a manufacturer of rubber. Salary: $8000. Employer will negotiate fee. Location: West Coast.

C-2079 PRODUCT SALES MANAGER —Steel. Age: 30-40. 5 plus yrs. exp. in sales of steel stampings or fabrications on contract basis. At least 2 yrs. sales supervisory background. Duties: supervising contract sales of steel stampings to automotive and appliance mfgers., also steel cabinets, jet engine components, basic wheels, mufflers and fuel tanks sold to defense industries. For a manufacturer of steel products. Sal.: $8,000 to $10,000. Location: Ohio.

C-2080(a) SALES ENGINEER—Grad. Eng. Age: 30-35. Exp. in sales organization of mfg. heating, ventilating, air conditioning or allied equipment. Duties: technical selling of heating ventilating, refrigeration, air conditioning, and heat transfer products. Sales accounts include consulting engineers, architects, contractors, jobbers and industrials. Sales offices from which calls are made on accounts in areas are located in 84 cities thruout U.S. For Mfg. & sales of heat., vent. Air and heat transfer. Salary: Open—Comm. Basis. Traveling. Car required.

C-2080(b) ASST. TO SALES MANAGER. Aircraft Sect. Heat Transfer Dept. Grad. Engr. Age: 25-30. Familiar with aircraft systems and components of systems. Knowledge of same. Duties: assist in planning sales programs presenting new ideas for products development and improvement and offering specialized product knowledge and sales assistance to field sales offices. Product worked with is light weight heat transf. surfaces for use in aircraft. Mfg. and sales of htg. Vent. Air Cond. and heat transfer. Salary: Open. Traveling. Car not required. Location: Wisconsin.

C-2080(c) ASST. TO MANAGER. Air Conditioning Unit Sales Dept. Grad. Engr. Age: 30-35. Home office sales organization of a manufacturer of air conditioning equipment. Duties: assist in planning sales program, presenting new ideas for product development and improvement, and offering specialized product knowledge and sales assistance to field sales offices. Product worked with is air conditioning equipment for mfg. sales heat. vent. air cond. & heat transfer. Salary: Open. Traveling. Car not required. Location: Wisconsin.

If placed in a position as a result of an Engineers Available or Position Available advertisement, applicants agree to pay the established placement fee. These rates are available on request and are sufficient to maintain an effective non-profit personnel service. A weekly bulletin of positions open is available to subscribers. Apply ESPS Chicago.

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949 MW PLANT ENGR. ME 32 Eight yrs. doing maintenance, plant layout, machine installation, design and supervision. $6000 Chicago.

950 MW ASST. CH. ENGR. ELECTRONICS 28 Four yrs. design and development of VhF reamplifiers, Uhf-Vhf tuners and maint. of production line test equipment. $8500 Chicago.

951 MW CHIEF OF PARTY ME 28 Seven yrs. resp. for design calculations, improvement of component equipment. Three yrs. doing steel maintenance work. $7200 U. S.

952 MW CHIEF ENGR. 54 Eight yrs. exp. in prod. eng., tooling, costs, appraisals, contracts. One yr. supervising employees of all depts. of metal plant. $7200 Midwest.

953 MW CHIEF ENGR. CE 36 Seven yrs. designing, drawing, checking on structural steel. $6600 Midwest.

954 MW STATISTICIAN MBA 28 Three & one half yrs. statistical quality control, design of experiments, sales forecasting, market research. $5500 Chicago.

955 MW IND. MGMT. ENGR. MBA 36 Six yrs. setting standards on clerical and plant problems. $5500 Midwest.

956 MW IND. MGMT. ENGR. ME 58 Twenty-five yrs. doing surveys, incentive plan development, methods, job evaluation, classification, material handling, plant layout, time studies, labor problems and standards. $5800 Midwest.

957 MW IND. MGMT. ENGR. ME 29 Twenty-five mos. expedite and inspect material purchased. One yr. timestudy, methods, plant layout, job classification and general mgmt. duties. Chicago $450.

958 MW ESTIMATOR ME 36 Eight yrs. estimating and design of heating and processing equipment. One yr. charge of mech. installation. $8400 West.

WSE Applications

In accordance with the By-Laws of the Western Society of Engineers, the following names of applicants are being submitted to the Admissions committee for examination as to their qualifications for admission to membership into the Society in the various grades, i.e., Student, Associate, Member, Affiliate, etc. All applicants must meet the highest standards of character and professionalism in order to qualify for admissions, and each member of the Society should be alert to his responsibility to assist the Admissions committee in establishing that these standards are met. Any member of the Society, therefore, who has information relative to the qualifications or fitness of any of the applicants listed below, should inform the Secretary's office. The Secretary's office is located at 84 East Randolph Street. The telephone number is RAndolph 6-1736.

54-54 Leo E. Stogentin, Sales Engr., American Manganese Steel Div., 389 E. 14th St., Chicago Heights, Ill.

55-54 George L. Landgren, Engineer, Commonwealth Edison Co., 72 W. Adams St.

56-54 Miss Elizabeth A. Jackson, Planning Associate, City of Chicago (Plan Commission), City Hall.

57-54 Harold C. Bergstrom, District Foreman, Commonwealth Edison Co., 72 W. Adams St.

58-54 Maj. General Douglas L. Weart, United States Army, retired, 908 W. Argyle St.

59-54 Albert Mohr, Jr., President, John Mohr & Sons Co., 3200 E. 96th St.

60-54 Louis E. Mohr, Vice President, John Mohr & Sons Co., 3200 E. 96th St.

61-54 Alfred W. Robinson, Engineer, John Mohr & Sons Co., 3200 E. 96th St.

62-54 Richard H. Ewert, General Sales Mgr., Illinois Gear & Machine Co., 2108 N. Natchez Av.

63-54 Harry J. Hofer, Station Equipmetn Engr., Illinois Bell Telephone Co., 212 W. Washington St.

64-54 Joseph S. Mohr, District Sales Mgr., General Refractories Company, 208 S. LaSalle St.

65-54 Robert C. Mohr, Sales Engineer, John Mohr & Sons Co., 3200 E. 96th St.

66-54 William B. Salzman (Rein.), Building Mech. Engr., Illinois Bell Telephone Co., 208 W. Washington St.

67-54 John D. Purdy, President, Geo. B. Limbert & Co., Inc., 208 S. LaSalle St.

68-54 David W. Nocchi, Assist. Commercial Engr., Public Service Co., 72 W. Adams St.

69-54 Henry E. Dodds, Assist. Supt., Underground Constr'n., Commonwealth Edison Co., 72 W. Adams St.

Heating Engineers To Meet in January

Philadelphia, Pa., in the heart of the booming Delaware Valley, will be host to the members of a fast growing American profession and industry when 30,000, including 3,000 members of The American Society of Heating and Ventilating Engineers, gather for the 61st Annual Meeting in the City of Brotherly Love, Jan. 24-27, 1955. In announcing this meeting President Louis N. Hunter, Johnstown, Pa., stated that the registration record set in 1953 will be surpassed.

There will be a complete program of technical sessions at which papers describing the latest research and developments in heating, air conditioning, ventilating and cooling will be presented.

The Committee on Arrangements of the Philadelphia Chapter, headed by John M. McElgin, general chairman, and John Everetts, Jr., vice chairman, announce that registration headquarters will be at the Bellevue-Stratford Hotel; the Benjamin Franklin, Warwick, John Bartram, Sylvania and other hotels have committed all available hotel rooms to accommodate the record influx.

The 12th International Heating, Ventilating and Air Conditioning Exposition to be held in conjunction with the 61st Annual Meeting will open at 2 p.m. on Monday, January 24, for a period of five days through Friday, January 28, at the Commercial Museum with nearly 400 exhibitors taking part, making it the largest show of its type ever held with estimated attendance of 30,000.

The Committee on Arrangements, in addition to Messrs. McElgin and Everetts, includes Merrill F. Blankin, honorary chairman; J. Owen Kirkbride, reception; Earle K. Wagner, entertainment; H. B. Prewitt, banquet; Edwin H. Dafter, ladies; Paul H. Yeomans, finance; George W. Powell, Jr., transportation; Archie M. Robertson, sessions; C. Fred Dietz, exposition; and Ludwig Mack, publicity.

Further information regarding the meeting can be obtained from Society Headquarters at 62 Worth Street, New York 13, New York.

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Automation Show To Be Held in N.Y.

Plans are announced for the First International Automation Exposition, to be held in New York City, the week of November 29th, 1954, at the 242nd Coast Artillery Armory (14th Street off Sixth Ave.). The Exhibit will be under the direction of Richard Rimbach.

In view of the universal interest in automation, a new kind of engineer and executive who thinks not only of automatic machines and automatic factories, but also of automatic industries, is developing. The First Automation Exhibit will open new vistas to the engineer and executive of this new age of automation.

Modern civilization is changing as new advances are made in automation. As these advances are proceeding very rapidly, it is important that the developments be placed before American industrial executives and engineers. The Automation Exposition will provide the first opportunity for manufacturers of automation and allied products to exhibit their latest advances to engineers and executives responsible for guiding future production methods.

Automation is defined by Rimbach as the use of automatic control, associated with some type of measurement, for the control of quality and reduction of costs in production. The measurement may be based on the direct measurement of any variable, or it may be the error signal representing deviation from a desired control point.

For complete information, including registration forms, write First International Automation Exposition, 845 Ridge Ave., Pittsburgh 12, Pa.

Seven Students Receive Fellowships

Seven students at Illinois Institute of Technology, Chicago, have received a total of $13,875 in fellowships for advanced study and research in chemical engineering.

The total figure represents stipends and tuition for work in preparation for master or doctor's degrees.

The fellowships were established at Illinois Tech by the Mixing Equipment company, Rochester, N. Y.; Monsanto Chemical company, St. Louis; Crane company, Chicago; Standard Oil company of Indiana; Swift and company; Shell Oil company, and the Chicagoland Paint Industries association.

Winner of the $2,000 Mixing Equipment fellowship was Hugo Nielsen, 3854 N. Oak Park avenue, Chicago, who received the grant for the second consecutive year. He is studying for the doctor's degree.

The Monsanto award, worth $2,150, was received by George Falk, 1046 - 76th street, Brooklyn, N. Y. A graduate of St. Olaf college, Northfield, Minn., Falk is studying for a master's degree.

Harold A. Lindahl, 2931 N. Lincoln avenue, North Riverside, Ill., is the recipient of a $2,000 Standard Oil fellowship, under which he will work for a doctor's degree. He is a graduate of the University of Illinois and earned his master's degree at IIT in 1951.

The $2,150 Swift fellowship was awarded to Richard N. Miller, 9247 S. Racine avenue, Chicago, for work on a master's degree. He attended Purdue university for two years and received his bachelor's degree in chemical engineering at Illinois Tech last June.

Gerald Robertson, 797 Summit avenue, Lake Forest, Ill., is the recipient of a $1,775 grant provided by the Crane company. As an undergraduate he studied at IIT under a 4-year scholarship provided by the Consolidated Natural Gas foundation.

A $2,150 Shell Oil fellowship was awarded to Joseph D. Lokay, 3748 S. Wenonah avenue, Berwyn, Ill., for work toward a doctor's degree. He also received bachelor and master's degrees at Illinois Tech.

A fellowship provided by the Chicagoland Paint Industries association worth $1,650 went to Bart Di Liddo, 1734 Northfield avenue, East Cleveland, Ohio. He is a chemical engineering graduate of Fenn college, Cleveland, and will study for a master's degree at Illinois Tech.

Unique Problems Solved for A.E.C.

In the design and construction of the Atomic Energy Commission's vast $1,219,000,000 gaseous diffusion plant in Pike County, Ohio, solution of unique engineering problems has been realized by extraordinary efforts and achievements of engineers and contractors, it is revealed in three articles prepared for the 37,000 members of the American Society of Civil Engineers and presented in the August issue of their magazine, *Civil Engineering*.

Superlatives apply in several phases —protection of residents near a steam power station by erection of three of the world's largest stacks to diffuse gaseous and other discharges, the largest power contract ever engaged in by a single customer in the history of the electric utility industry, the extraordinary use of some 1,500,000 high strength bolts instead of rivets to speed construction and the requirements met in transforming a 3,700-acre farm region into an industrial section centering around the biggest Government-owned plant, unlike any ever before contemplated.

The dramatic and ambitious achievements involved in the AEC project under way at Waverly, Ohio, 20 miles north of Portsmouth and 25 miles south of Chillicothe, and also at the power stations near Madison, Ind., and Gallipolis, Ohio, are reported in technical detail under the by-lines of authoritative participants.

In an article on preparation of the site, David J. Brumley, general engineer at the AEC Portsmouth Area Office, states that construction, begun two years ago and proceeding on a four-year schedule, "is so designed that the plant goes into operation in units or segments." He writes in part:

"The purpose of the AEC's gaseous diffusion plants, such as the one at Portsmouth, is large-scale separation of the uranium isotope 235 from a chemical compound of uranium by the process of gaseous diffusion through porous barriers. The process involves several thousand stages. No plant exactly similar to the one at Portsmouth ever before has been contemplated.

"A primary consideration was the ability to obtain large blocks of interim and permanent power."

The extensive studies and the design required to protect area residents at the steam plants are related in another article written by Philip Sporn, President, and Herbert A. Kammer, vice-president of the Ohio Valley Electric Corp., organized by privately owned utilities to assume "the largest power contract ever engaged in by a single customer in the history of the electric utility industry."

Almost two years ago, the corporation and the AEC signed a 25-year agreement for the supply to the AEC gaseous diffusion plant of 15 billion kilowatt hours per year. To fill the contract, the Ohio Valley Electric Corp., and its wholly-owned subsidiary, Indiana-Kentucky Electric Corp., are building two large steam-electric generating stations, one at Madison 150 miles west of Waverly, the other near Gallipolis, 40 miles east of Waverly. The Madison plant has been designed for a net capacity to feeders of 1,200,000 kw and the other for a net capacity of 1,000,000 kw.

The total cost of the two steam-electric generating stations and 400 miles of double-circuit 330,000-volt transmission lines required to transit the power to the diffusion plant, together with necessary interconnections with the private utility companies forming OVEC, will be some $400,000,000.

Stock in OVEC is held by American Gas and Electric Co., Cincinnati Gas & Electric Co., Columbus and Southern Ohio Electric Co., Dayton Power & Light Co., Kentucky Utilities Co., Louisville Gas and Electric Co., Ohio Edison Co., Southern Indiana Gas and Electric Co., Toledo Edison Co. and West Penn Electric Co.

The first unit of the Clifty Creek plant, near Madison, is scheduled to be in operation next January. The first unit of the Kyger Creek plant, at Chesire, near Gallipolis, is due to be placed in operation next March.

"In the development of a project of such magnitude," says the Sporn-Kammer article, "special problems arose in all the various fields of engineering involved." Describing the steps taken to protect area inhabitants from possible atmospheric inversion and the trapping of stack gases within the valley, the authors say:

"The most modern equipment was specified. The best available technical methods at the disposal of the engineer, scientist and meteorologist were marshaled in an all-out effort to protect inhabited areas near these plants from any possible combination of conditions which might be considered objectionable."

The paper recites that 480 wind-tunnel model tests were made by the University of Michigan Engineering Research Institute at Ann Arbor, weather bureau records were consulted, topographic maps were studied, surrounding terrain was inspected. Each station was to have three stacks. The article relates the course decided on as a result:

"Heights finally selected were 682 feet above plant grade for the Clifty Creek station, and 538 feet for the Kyger Creek station. In each case the top elevation of the stacks was over 300 feet above the average height of the hills bordering the valley. In addition to the unusually high stack heights, a full-load gas-discharge veloc-

ity of 82 miles per hour was selected to provide a jetting force to add appreciably to the upward velocity of the gas even with a strong horizontal wind.

"The possibility of an atmospheric inversion occurring and trapping stack gases within the river valley was considered. It was concluded that the most effective means of preventing this would be to have the stacks extend well above the level of the highest hills in the vicinity. The stacks, as designed, actually extend further above the adjacent hills than do the stacks of most modern steam-electric plants above their own plant grade level. When and if an atmospheric temperature inversion is experienced, the discharge from the stacks will spread out and eventually be dispersed in the upper atmosphere far above the 'lid' normally associated with such inversions and occurring at a level above the tops of the valley walls. Such a 'lid' blocks the stack discharge from entering the valley by the same mechanism that prevents the air below it from diffusing upward out of the valley."

In reporting the construction methods used at the Portsmouth Area site, Harold H. Nicholson, of the Portsmouth contracting firm of Peter Kiewit Sons' Co., writes that about 100,000 tons of structural steel were required to provide a floor area of 222 acres. His article, dealing with the construction of the three process buildings, half-a-mile long each and containing 79,000 tons of structural steel, reports the use of a million and a half high-strength bolts to speed up steel erection. There was also a relatively minor use of rivets. This, says the article, was the first large high-strength bolt job in the area and it was necessary to establish operational methods and train men in the proper use of the equipment. Bolts were chosen because of all-around savings in cost.

Bolt tightening crews used air impact wrenches "which can be operated under closely controlled conditions to produce fast, accurate, economical work," says the article. In discussing this major use of bolts instead of rivets, Nicholson states that although "the bolt, washers and rivets delivered to the job cost about six times more than rivets" and certain other factors were disadvantageous in in the use of bolts, there were many factors favorable to the use of high-strength bolts. Speedy training of expert bolting crews and their preference for bolting because the impact wrench is light, clean and easy to operate were among the advantages revealed in the use of high-strength bolts.

Nicholson writes that "with continued research, refinement in design and improvement of materials and methods, the use of high-strength bolts as fasteners will be fairly universal in another five years." High-strength bolts as substitutes for rivets have been used only within the past seven years, says the article.

Power Engineer Show Is Set for Dec.

Exhibitors at the 21st National Exposition of Power and Mechanical Engineering at Philadelphia will include, in addition to many newcomers, a number of companies returning after absences from recent events. The rising total will equal or exceed the 1952 display. The scheduled dates, Thursday, Friday, and Saturday, Dec. 2, 3, and 4; and Monday and Tuesday, Dec. 6 and 7, were arranged during the period of the 74th annual meeting of the American Society of Mechanical Engineers, under whose auspices the exposition will again be held.

Exhibits already located in the exposition comprise the entire field of power plant engineering and associated mechanical apparatus, from the cold fuel through to the turning shaft; even to the final application of power to the productive machine, whatever it may be. There will be displays by producers and fabricators of raw materials in great variety; boilers and steam generators; gas and oil burners; auxiliaries representing every avenue of economy in the production of steam for processing, as well as for power purposes. The range includes a long list of mechanical and electrical drives and transmissions, material handling equipment of every description, piping, valves and controls.

Instrumentation will reach new peaks of interest for visitors through the latest developments in automation. Equipment for research is keeping step with the exotic demands of the atomic age, as power plant engineering advances from steam to the internal combustion turbine and reaches toward the atomic power plant of the future.

Advances that will permit new theory and design to reach reality center on materials increasingly resistant to extreme temperatures and pressures, and even more so, increasingly resistant to wear and corrosion. New materials and their applications will therefore highlight the exposition, up to the limit of permissible disclosure; for many exhibitors are moving rapidly ahead in classified areas, whose impending impact may only be surmised.

Philadelphia's great Commercial Museum, where the exposition will be held, has the advantage that all spaces are on the ground level, with complete facilities for electrical and mechanical services, and ample access for rapidly handling materials in and out.

As heretofore, the exposition will be under the management of the International Exposition Company, with headquarters at 480 Lexington Avenue, New York. E. K. Stevens is the exposition manager.

CRERAR LIBRARY

News and Notes

A year ago Crerar contracted with the Special Libraries Association to maintain and service the S.L.A. Translation Pool. Under the agreement, cooperating associations, industries, and individuals supply copies of translations of scientific and technical articles and books which are filed or microfilmed and returned. Other persons needing translations are thus able to check availability in the Pool before having a translation made themselves, often an expensive operation. At the present time some 1600 different items have been contributed, from 17 foreign languages, especially German, French, Italian, and Japanese. (Russian translations are pooled in the Scientific Translation Center at the Library of Congress). Copies may be obtained through Crerar's Photo-duplication Service at a moderate fee or borrowed for a short period. An initial list published last January is still available on receipt of 30¢ to cover mailing and a supplement appeared this month which may be obtained on payment of $1.00. To date, 167 translations have been provided to companies throughout the United States and in 4 foreign countries. Although the Pool is not indexed by subject, nearly all sciences are represented. Inquiries should be addressed to the S.L.A. Translation Pool, John Crerar Library.

* * *

The grant of $5,000 reported in the press last month will come to Crerar through the Chicago Section, American Chemical Society. The money has been made available through a joint bequest from the estate of the late Dr. Vladimir N. Ipatieff, world famous chemist of Northwestern University, and an anonymous donor. The fund will be used to buy chemical books as a memorial to Dr. Ipatieff.

* * *

A recent check was made by the Library on the number of issues of serial publications, such as magazines and bulletins, handled by the Serials Department. The sampling indicates that approximately 141,000 pieces are processed annually. Of course, some 95,000 are added to the collections, with the remainder sold, used for exchange purposes, or discarded.

Big Airplanes Get New Shelter

A new-type portable maintenance shelter for B-29, B-50 and C-97 aircraft that will greatly speed up engine maintenance work and enable personnel to perform around-the-clock servicing in any kind of weather or climate has been adopted by the United States Air Force for extensive use at bases in this country and elsewhere.

The mobile unit's design allows it to be moved readily to a plane's location on the ramp, thus reducing considerably delays in getting maintenance work under way caused by unfavorable weather, by lack of available unoccupied hangar space and by the time required to move aircraft closer to permanent service facilities. It can be positioned on aircraft and be completely "buttoned up" within 25 minutes.

The low-cost standardized steel shelter, which is mounted on pneumatic tires for rapid movement on airfields, was designed to Air Force specifications by the Luria Engineering Company of Bethlehem, Pa., designer, fabricator and constructor of standardized steel hangars and industrial buildings.

An initial order for 100 of the mobile shelters has been placed with the company by the Air Materiel Command at Wright-Patterson Air Force Base in Ohio.

The structuré, which comes equipped with adjustable work platforms and lighting facilities, is the first completely enclosed, all-weather portable shelter developed for B-29, B-50 and C-97 aircraft.

Mass-production of the standardized shelter was begun after a series of tests at the Luria plant and at the Hunter Air Force Base in Savannah, Ga.

The structure consists of a structural steel framework covered with corrugated steel roofing and siding. It is about 18 feet long, 15 feet wide and 25 feet high.

Mounted on four wheels equipped with pneumatic tires, the front end is swiveled and linked to a towing tongue for easy maneuverability.

The shelter has openings that permit it to be placed on the inboard or outboard engines of B-29, B-50 and C-97 aircraft.

The all-weather service feature is attained by means of specially-designed canvas curtains and resilient pads that provide tight closure around the wings and nacelles. Tight closure is assured regardless of the altitude of the plane's wing or the position of the plane in the shelter. Easy access to the engines is furnished by the adjustable work platforms and stairs.

Facilities for flood-lighting the interior, as well as power outlets, are included in an electrical harness which may be connected into power sources available on any base.

Leveling jacks and mooring facilities are provided to preclude movement of the shelter during normal use or when winds exceed 35 miles per hour.

The shelter is designed to be towed to position by a tug or other motor-driven vehicle. A crew of five men is required to place the shelter in position on an aircraft and to close the curtains around the wing and nacelle.

Water Shortage Causes Concern

In its grave concern over expanding needs for water and the shortages prevailing in some parts of the country, the nation also is confronted with a very serious problem of pollution, Gail A. Hathaway, of Washington, D. C., world distinguished authority on power and related fields, states in an article addressed to the members of the American Society of Civil Engineers, of which Hathaway formerly was President.

Hathaway is stationed in Washington as Special Assistant to the Chief of Engineers, U. S. Army. He also is chairman of the U. S. National Committee of the World Power Conference and is vice-president of its International Executive Council and president of its International Commission on Large Dams. At present he is in Brazil where he has been attending conventions of the World Power Conference and of UPADI, the organization of engineering societies of most of the nations of the Western Hemisphere. At the UPADI convention, Hathaway is a delegate of Engineers Joint Council, organization of eight major United States engineering societies.

Hathaway's article, which is published in the August issue of "Civil Engineering" magazine, states that although there are 250,000 industrial plants in the United States the bulk of the water used for industrial purposes is required by a relatively few large industries. "One steel mill may require 500 million gallons per day, enough for a city of several million population," says the paper. "It is estimated irrigation accounts for 80 percent of the total consumptive depletion of all water uses. Although irrigation previously has been confined mostly to the West, large areas in the East now are being subjected to supplemental irrigation to increase crop yields."

Hathaway observes further:

"Water pollution is a nation-wide problem. One of the major sources of pollution is the dumping of raw sewage into streams. Half the population of the United States is served with sewer systems which discharge almost 6 billion gallons daily, of which half receive some treatment and the other half is discharged into the streams untreated.

"Rapidly increasing industrialization, with most plants located adjacent to or in the vicinity of our streams, has been accompanied by the serious problem of taking care of the industrial wastes, which, for the most part, are discharged into the streams. This industrial waste now is equivalent to the domestic pollution of an additional 100 million persons in the United States."

Hathaway urges:

"To meet the ever-increasing demand for water, more and more of our needs must be solved by re-circulation, reclamation of used water and better use of existing supplies. The movement of industry to the West and the development of ore in the Rocky Mountain region may force the Western States to consider re-allocation of water rights, and the East must decide to what extent its cities and industries can be allowed to continue the wholesale pollution of its streams."

The article stresses "the urgent need for a sound national policy for the development and conservation of our water resources which will provide for the active cooperation and joint participation of individuals and industry, as well as local, State and Federal governments" and that "in the implementation of such a policy, it must be recognized that the narrowing margin between the present water supply and the amount ultimately available is going to require more knowledge, better engineering and increased consideration of complicating factors on the part of all water users."

Corps of Engineers Moves to New Office

Removal of the office of the Great Lakes Division, Corps of Engineers from its present location at Fifth Army Headquarters, 1660 E. Hyde Park Blvd., to the Rand McNally Building, 536 S. Clark, Chicago, was authorized by the chief of engineers, Major Samuel D. Sturgis, Jr. The move was made about August 21, 1954.

In making this announcement on Aug. 24, Colonel W. P. Trower, division engineer, said the move resulted from the need for additional office space caused by the recently announced consolidation of the Rock Island, Illinois, and St. Paul, Minnesota, Districts of the Upper Mississippi Valley Division of the Corps with the Great Lakes Division.

Under the consolidation, the St. Louis headquarters of the Upper Mississippi Valley Division at St. Louis is being abolished and the St. Louis district office will be transferred to the Lower Mississippi Valley Division, Vicksburg, Miss.

Effective September 1, 1954, the Great Lakes Division is being designated as the North Central Division.

The division engineer also announced that the chief of engineers has approved transfer of the Regional Statistics Office, which operates under the Great Lakes Division, from Detroit to Chicago. The statistics personnel also will move into the Rand McNally Building, where all units of the Division will occupy part of the tenth floor.

Reviews of Technical Books

Transistors

Fundamentals of Transistors, by Leonard Krugman, John F. Rider Publishers, Inc., New York, N. Y., First Edition, 1954. 140 pages. Price $2.70.

This paper-bound book was written for the technician but is a useful introduction to the transistor for the engineer and the engineering student.

After a short chapter on the basic physics of semiconductors, particularly transistor germanium, the author, writing from the Signal Corps Engineering Laboratories, describes the construction and operation of typical point-contact and junction transistors. Next he analyzes three transistor connections—grounded base, grounded emitter, and grounded collector—with the help of simple circuit diagrams and the mathematical equations necessary for the understanding of transistor circuit design. The reader is given a basic understanding of transistor characteristics, limitations, and testing methods and led into a discussion of the operation and circuitry of transistor amplifiers and oscillators and of transistor operation at high frequency.

Frequent comparison of transistor uses with vacuum tube uses in the book should help those familiar with tube circuits "get the feel" of transistors which while simple in themselves are more complicated in circuit design and maintenance and more flexible in their application to electrical circuits than tubes.

J.C.B.

Power Transmission

Electric Power Transmission, by John Zaborszky and Joseph W. Rittenhouse, The Ronald Press Company, New York, N. Y., First Edition, 1954. 676 pages. Price $12.50.

This book, designed as a reference work for practicing engineers as well as a text book for graduate and undergraduate study, was prepared at the University of Missouri, School of Mines and Metallurgy.

It contains a full treatment of inductive and capacitive reactance of transmission lines; conductor resistance; skin effect; corona loss; underground cable constants; distributed constants on transmission lines; and the performance of transmission lines and power systems in the steady state. In addition there are some 60 pages of introductory material designed to acquaint the student with the basic structure of the power system. There is a chapter on the economic problems involved in existing systems and future facilities. There is new material throughout the book but chapters 9 and 10, which treat of voltage and load-frequency regulation on the power system, offer the first textbook development of that subject. The most up-to-date methods of analyzing power system performance and some original material dealing with transformer mismatch in a network are included.

Problems based on each subject are included in the chapters. Two appendixes are included to provide information on conductor characteristics and the solving of simultaneous linear equations. There is extensive bibliographical material throughout the book.

J.C.B.

Die Forging

The Closed Die Forging Process, by P. E. Kyle, The Macmillan Company, New York, N. Y., First Edition, 1954. 140 pages. Price $1.50.

Professor Kyle of Cornell University has written a brief but profusely illustrated book on the production of drop forgings in metal dies for use as a supplementary text in engineering colleges and in technical school forging courses.

The book discusses the fundamentals of hot working of metals and describes the various pre-heating furnaces and forging machines. Step-by-step illustrations lead the reader through the production of the drop forging die and of the forging itself; then through the testing and inspecting procedures. The properties of various forged metals are listed and tabulated and the book closes with a glossary of forging terms.

J.C.B.

Hydro Power

Hydro Power Engineering, by James J. Doland, The Ronald Press Co., New York, N. Y., First Edition, 1954. 209 pages. Price $7.50.

The author, a professor of hydraulic engineering at the University of Illinois, has written on the practical approach to the planning and design of hydroelectric powerplants. The book is meant to serve as a one-semester text for civil engineering students.

After outlining water power development in the United States, Professor Doland maps out the basic theory of water power study defining terms and providing the simple equations used in determining turbine efficiency, speed, size, and potential power output. He then goes on to stress the use of stream flow data analysis in determining plant capacity and the design of auxiliary equipment. Successive chapters deal with the selection of different turbine designs for various operating conditions; the design of powerhouses and water passages; and the selection of water control gates, valves, surge tanks, and water control governors.

The text is generously illustrated with photographs and diagrams, provides problems on the material in each chapter, and has a detailed index.

The bulk of the material in the book is drawn from actual hydroelectric power installations and the emphasis is on practical planning based on past performance and test data of the various components of the powerplant.

J.C.B.

Chemical Exhibit Is Chance for Inventors

Any chemist with a new idea, a new material, a new device or a new observation waiting for fame and fortune has been invited to submit it to the 8th National Chemical Exposition for its Chemical Trail Blazer's Exhibit.

Since 1944, the exhibit has been part of the big biennial national show, which this year will be held in the Chicago Coliseum October 12 to 15. Space is made available free for any kind of chemical novelty and all the hopeful chemist need do is send his request for space to Dr. Paul E. Fanta, Trail Blazer chairman, at the Illinois Institute of Technology, Chicago 16.

Before deciding to include the exhibit in the 8th show, the committee sent a questionnaire to all previous entrants to see if the activity is worth while. It showed that more than 25 per cent of the ideas exhibited as brand new in the last five shows had gone on from that introduction to become important chemical items or processes and that five or ten major ideas have developed out of each previous show.

For instance, a helium liquefier shown in 1948 is now a basic tool of cold research laboratories all over the world and credited with a great part of the remarkable advances made in this field of study. The same year brought out a process for making yeast from waste sulfite liquor, which is now in commercial production.

A process of treating oil field flood water to increase production first shown in 1950, is now being used by at least sixteen institutions. The use of chlorophyllins in tooth paste was also first shown as a 1950 trailblazer.

The use of isophthalic acid in surface coatings has developed from an idea in 1952 to a production of 50,000,000 pounds a year. A nitric phosphate fertilizer shown then is now being made in two new plants with a total capacity of 260,000 tons a year.

The success of the previous exhibits decided the exhibit committee to enlarge the space devoted to it this year, it was announced by Dr. Thomas U. Marron, chairman of the Exposition Committee. The number of persons attending the Exposition who visit the Trail Blazers in the search for new ideas and new products increases each year, he added, as its reputation for originality value spreads.

Each exhibitor is allowed as a basic unit a panel with a display area three by four feet, while some exhibits are shown on tables or in self-contained units and some take more than one panel. Color, lights, samples, photos, models or any other method of display may be used, and the Exposition unpacks, mounts and repacks the exhibit for return free of charge.

Views on Trucks Given by Contractors

Contractors, who account for 13 per cent of all truck sales in the United States, are dissatisfied with the quality and durability of their trucks, according to a survey conducted by Construction Methods and Equipment, McGraw-Hill publication, among 204 contractors in 43 states. Furthermore, most contractors complain about the high prices of spare parts and accessories when purchased from the original manufacturer.

Practically all contractors believe clutches and brakes could be improved; one contractor states that brake linings and drums are not protected sufficiently from the elements. Other major truck ailments on construction jobs are in electrical systems and engines, as well as running gears and truck bodies. Some contractors, the survey reveals, strengthen the frame on a brand new truck before it is ever sent out on the job. One contractor, pointing out that the electrical systems being used on trucks were the same as those used on passenger cars, says, "They weren't designed for truck use, so how does the manufacturer expect them to stand up?"

Currently, contractors are using 1,183,250 trucks, in addition to purchasing vast amounts of gasoline, oil and grease, and spending billions of dollars on tires, engines, carburetors, fuel pumps, spark plugs, brakes, and other maintenance needs and accessories. The importance of the construction industry to automotive and truck manufacturers is indicated by the average number of trucks per contractor as revealed by the survey (25 each), as well as by the extensive fleets owned by the larger concerns (one Western contractor owns and operates a fleet of 845 trucks). Realizing their value to the trucking industry, contractors are going to insist the manufacturer supply them with a better and longer-lasting truck, and at about the same price, the magazine says.

Over the last few years, contractors have learned that length of life of a truck depends to a great extent on what steps are taken to maintain and service trucks properly. Although three to five years is the average life of most contractor trucks, proper maintenance and service have kept some trucks running as long as ten to twelve years. Of the 204 contractors surveyed, 164 operate their own repair shops. One Connecticut firm spent close to $500,000 last year for parts and accessories for its 139 trucks. Another contractor uses a weekly driver and operator report that is filled out in duplicate each week and sent to the field office, listing daily fuel and oil consumption, amounts of grease used, oil changes, hours actually worked, and time and types of repairs; this system is used to keep a close check on operating costs.

Advisory Committee For Power Show Set

Organization of the Advisory Committee for the 21st National Power Show has been completed under the continued chairmanship of I. E. Moultrop, consulting engineer, of Boston. As previously announced, the show, officially known as the 21st National Exposition of Power and Mechanical Engineering, will be held at the Commercial Museum in Philadelphia, December 2 to 7, under the auspices of the American Society of Mechanical Engineers. Reservations already made indicate that the display in Philadelphia will equal in number of exhibits the last show of the series, which was held in New York, two years ago.

John H. Lawrence again serves as vice chairman of the Committee. Others continuing on the Committee are: Chester R. Earle, Managing Editor, "Power Engineering"; Kilshaw M. Irwin, Vice Pres. in Charge of Engineering, Philadelphia Electric Co.; George A. Orrok, Boston Edison Co.; Joseph Pope, Vice Pres., Stone & Webster Engineering Corp.; C. J. Sibler, Chief Engineer, West Virginia Pulp & Paper Co.; A. Bowman Snavely, Chief Engineer, Hershey Chocolate Corp.; and Philip W. Swain, Editor, "Power."

Members newly appointed to the Committee this year include: M. J. Goglia, Professor, School of Mechanical Engineering, Georgia Institute of Technology; Arthur J. Hess, Pres., American Society of Refrigerating Engineers; L. N. Hunter, Pres., American Society of Heating and Ventilating Engineers; and C. E. Morrow, Engineer, Power and Service Facilities Engineering, Western Electric Co.

Representing the American Society of Mechanical Engineers on the Committee are: Lewis K. Sillcox, MWSE Pres., Hon. Vice-chairman of the Board, New York Air Brake Co.; A. C. Pasini, Director, The Detroit Edison Co.; T. R. Olive, Chairman, Board on Technology, McGraw-Hill Publishing Co.; J. Keith Louden Chairman, Meetings Committee, York Corporation; and C. E. Davies, Secretary.

As heretofore, the exposition will be under the management of the International Exposition Company, with headquarters at 480 Lexington Avenue, New York 17, N. Y. Charles F. Roth is Manager of the Exposition; E. K. Stevens, Associate Manager.

Aluminum Panels Are Exceptionally Light

Aluminum panel walls enclosing the steel frame of a new building in Dallas weigh only 4.5 lbs. per sq. ft., one-ninth the weight of exterior walls that only two years ago were considered of recordbreaking lightness, according to Engineering News-Record, McGraw-Hill publication.

The new $20-million structure is enclosed with two types of panels. One, used for one wall forms an unbroken expanse of aluminum for the full 36-story height of the building, except for four windows in the 35th story. The second type, used for other exterior wall, is comprised of story-high aluminum panels incorporating windows; it is this second type that weighs only 4.5 psf.

The panels with windows consist of a one-eighth-inch-thick aluminum facing backed up with glass-fiber insulation and an aluminum-foil vapor seal. Total thickness is one-and-one-half inches, the magazine says. Behind the walls below window level and separated from them by a four-inch air space, are air-conditioning units in a continuous metal enclosure.

Windows occupy nearly the full width of the panels. Glazed with heat-absorbing glass, they are vertically pivoted so that they can be cleaned from inside the building. Continuous plastic strips form a seal between sash and frame.

The new building is noteworthy also for several other reasons, the magazine continues, including arrangement of facilities, structural framing in the eight-story base section of the building, air conditioning and elevators.

The 36-story tower is at one end of a long eight-story base devoted principally to banking. To keep the main banking room clear of columns, floors above were suspended from five 130-ton trusses in the seventh story.

Refrigeration is accomplished with two 1,000-ton steam-turbine-driven centrifugal units, with steam provided by gas-fired water-tube boilers.

All elevators are of the fully automatic, operatorless type; the owner will decide how many will be attendant-operated. High-rise cars will travel at 1,000 fpm; low-rise cars, at 700 fpm. Banks of these elevators will be controlled by electronic traffic analyzers, and electronic door detectors—proximity devices—will prevent doors from closing prematurely on passengers.

Science Research Leaders Convene

Leaders in the administration of scientific research are meeting at New York University Sept. 8, 9, and 10 for the eighth annual Conference on the Administration of Research. Approximately 250 persons, heads of educational, industrial, and governmental research units, are expected to attend the meeting in NYU's Vanderbilt Hall at Washington Square, New York City. The conference coincides with the opening of the Centennial celebration of the University's College of Engineering.

Through case studies the conferees will consider communications problems in research operations, management and physical facilities for research, the appraisal and reward of research output, and the place of basic research in an applied research laboratory.

The conference was initiated in 1947 by a group of men who, not previously accustomed to administering large organized research groups, had been placed in charge of rapidly expanding laboratories established during World War II. Principal aim of the conference is the exchange of information regarding practices and procedures in the administration of research laboratories.

Past conferences have included discussions of security restrictions in government-sponsored research; international problems; selection, control, and termination of research projects; qualifications of research executives; and many aspects of the financing of research.

Dr. Harold K. Work, director of the Research Division of NYU's College of Engineering, represents the host institution at the eighth conference.

WSE Personals

Thomas F. Curran, MWSE, is now working for Universal Oil Products Co. as a technical service engineer. At the present time he is in Corpus Christi, Tex., at the Pontiac Refining Co., helping to get a new "Platformer" underway. Previous to his arrival in Corpus Christi he had spent six months in Fort Worth "starting up a Cat-cracker and training the operating crews."

* * *

Northern Illinois Gas Company on July 26 announced the appointment of **Charles F. Henness,** MWSE, as division manager in charge of the company's operations in its northern division.

Henness, who has been associated with gas sales and managerial roles during most of his 29-year career with the Public Service Company, has been division gas superintendent for Public Service in this area for eight years. He now assumes charge of the gas company's operations in its northern division which includes the north and northwest suburban communities in Cook, Lake and McHenry Counties. His headquarters will be in Evanston.

Northern Illinois Gas Company took over the operation of the Public Service Company's gas properties early this year.

Henness said that the separation of gas and electric operations is proceeding in an orderly manner and it is hoped that it can be completed late this year or early in 1955.

For the convenience of customers, it is planned that present Public Service Company salesrooms and service offices will continue to be available for the payment of bills and transaction of business, either gas or electric. Pending rearrangement of telephone facilities, he pointed out that the local Public Service Company telephone number should be used to reach the gas company.

Northern Illinois Gas Company also announced on July 26 appointment of **Raymond O. Stauss,** MWSE, as division manager in charge of the company's operations in its southern division.

Stauss has held a number of executive positions with the Public Service Company since he began his utility career in 1925. He has been closely allied with gas operations since 1946 and has been southern division gas superintendent for Public Service for the past two years. Stauss now assumes charge of the gas company's operations in the division which includes the south suburban communities, Blue Island, Harvey and Chicago Heights, and extends to Kankakee on the south and as far west as the Ottawa area. His office will continue to be in Joliet.

* * *

Martin W. Oettershagen, MWSE, a strong backer of the St. Lawrence Seaway, was appointed deputy administrator of the project on Aug. 4, by President Eisenhower. His $16,000 post must be confirmed by the Senate.

Oettershagen, who started working for the city of Chicago 40 years ago, studied engineering at Armour Institute. At the time of his recent appointment he was Chicago's port manager, located at Navy Pier.

Reorganize Ceramics, Minerals Department

The ceramics and minerals research department at Armour Research Foundation of Illinois Institute of Technology, Chicago, has been reorganized as a result of its increased scope of activities.

Dr. Einer P. Flint, department manager, announced that a new research section has been created and names of three of four previously-existing sections have been changed.

The newly-organized ore dressing section, concerned with the beneficiation of both non-metallic and metallic ores, is headed by Dr. Kenneth C. Vincent, formerly chief metallurgist with the Baroid Sales division, National Lead company.

Albert Litvin, who was head of the cement physical testing laboratory at the National Bureau of Standards until 1950, is supervisor of the building technology section, known previously as the masonry materials section.

J. Scott Griffith, a staff member at the Foundation since 1941, is supervisor of the geology and mineralogy section, formerly known as the minerals section.

Supervisor of the chemistry of mineral products section, formerly called the inorganic technology section, is Samuel W. Bradstreet Jr., who was with the Great Lakes Carbon corporation before joining the Foundation in 1948.

Dr. James A. Stavrolakis, who was engaged in atomic energy research for General Electric company in Oak Ridge, Tenn., until 1952, continues as supervisor of the ceramics section.

Gigantic Steel Net Holds Back Mountain

In a new application, a gigantic net of steel fence is holding back a mountainside to prevent landslides which threaten the new Palisades Dam Project on the Snake river in Idaho.

Conventional chain link fencing—20,000 square feet of it—is anchored to slopes towering above the project as a retaining mat to keep the dam's intake tunnels free of debris.

U. S. Steel's Cyclone Fence division worked with the Palsides contractors, a joint venture of J. A. Jones Construction Co., the Chas. H. Tompkins Co., and the U. S. Bureau of Reclamation, to lick one of the toughest problems confronting the project engineers.

Discharge tunnels from the dam, the largest earth-filled dam yet to be constructed by the Bureau of Reclamation, had to be cut through a rugged mountain.

During excavation for tunnel intake structures, despite repeated sealing operations by the contractor, rocks were continually falling to lower levels. This dangerous situation continued even after completion of excavation in these areas.

Officials decided to install steel mats to hold the rocks in place. Not only during remaining construction of the tunnels but in the future intake structures will rest on top of the tunnels, and a free flow of water through them must be assured. This is the first time in dam construction that fencing has been used as retaining shields.

A fencing crew has just completed the job, begun this spring. Holes eight feet deep and five inches in diameter were drilled on the top of the mountain to hold steel anchor rods, which were then cemented in place. A heavy steel cable was strung through each of 15 rods. With specially made pickets the wire mesh mats were laced in place at the top of the mountain.

At the bottom of the installation similar anchor rods hold another cable to which the matting is secured. Distances from the top to the bottom vary from 50 feet to 150 feet. The chain link fencing, because of its high tensile strength of 80,000 pounds per square inch, made the project possible.

Computer Clinic Meets in New York

Announcement is made of the First Electronic Computer Clinic, to be held in conjunction with the First International Automation Exposition, at the 244th Regiment Armory, 14th Street between 6th and 7th Avenues, New York, N. Y., Nov. 30 to Dec. 2. (The Exposition dates are Nov. 29-Dec. 2).

The clinic is a lecture and demonstration course on electronic computers, digital and analog, and will offer for the first time, demonstrations and typical applications of different types of computers. The wide general interest in applications of electronic computers assures that this clinic will be of great importance in opening up the application possibilities of electronic computers within the vast field of automation.

The Clinic is planned for top management, management engineers, production engineers, physicists, chemists, and others who contemplate using computers in the plant or laboratory. Advance registration will be required and is now being offered via nation-wide publicity. No registration will be accepted from individuals employed by computer manufacturers.

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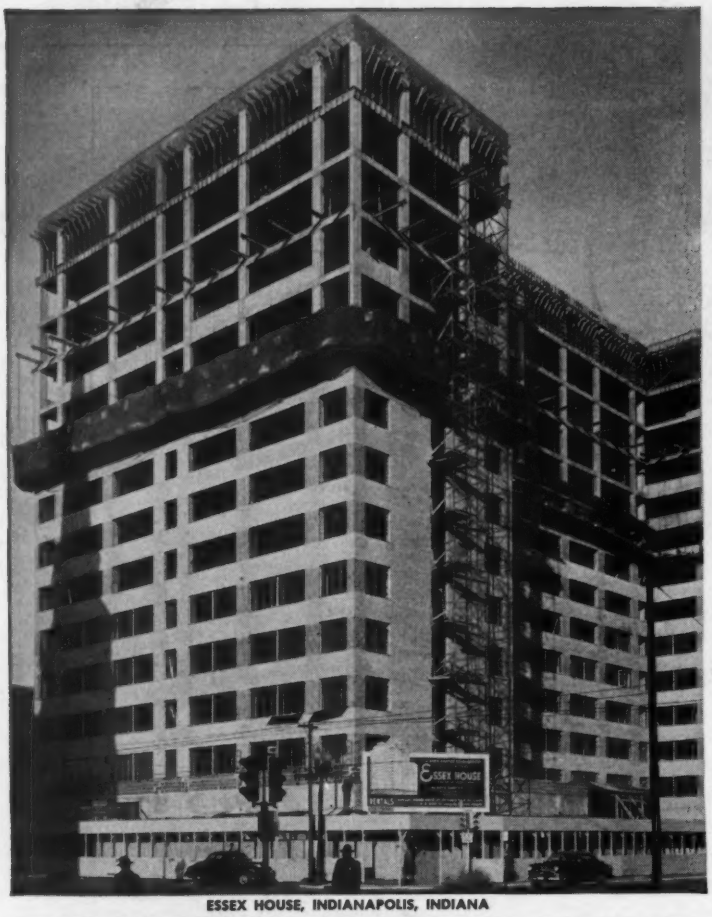

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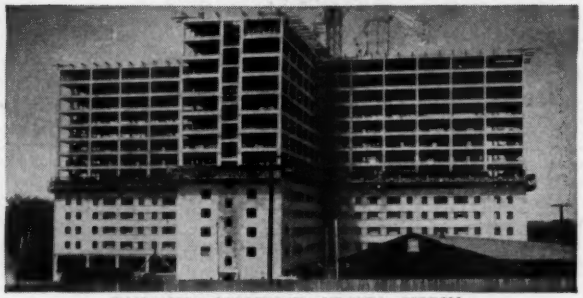

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